ARCHIVES OF OTOLOGY.

PRIMARY DISEASE OF THE BONY LABYRINTHINE CAPSULE.

By Prof. ADAM POLITZER, of Vienna.

Translated by Dr. J. A. Spalding, Portland, Me.

(*With eight figures in the text.*)

THE topic of the following article will be a hitherto erroneously diagnosticated form of disease of the ear, which, beginning with symptoms of progressive loss of hearing, generally terminates in incurable deafness.

Owing to its clinical course, this disease has previously been tabulated in the group of chronic dry catarrhs of the middle ear, the so-called sclerosis of the middle-ear mucosa. A series of observations of a clinical nature, made in late years, from cases that later came to the post-mortem table, show, without a shadow of doubt, that in a considerable number, which, from their clinical symptoms and their usual course, we are inclined to attribute to chronic middle-ear catarrhal disease, the anatomico-pathological foundation for the loss of hearing is not to be sought for in a disease of the mucosa at all, but *in a primary affection of the bony labyrinthine capsule.*

A number of exceedingly deaf persons in whom, according to the observation of friends, the loss of hearing had been slowly progressive, exhibited, *post mortem, in the region of the niche of the oval window*, more or less sharp *bony protuberances*, which were set off from the neighboring district by their pale yellow or curiously reddish tint.

These protuberances, mostly covered *with normal mucosa*,

were the size of a pea, and extended into the normal tissue through flattish edges. They were most pronounced in front of the niche, though sometimes behind, whilst once they surrounded it entirely, so that the niche was contracted and appeared flat. Several specimens exhibited an elevated promontory, and both labyrinthine windows were considerably contracted.

The mucosa of the middle ear was generally normal, rarely thickened, or gray, and occasionally interrupted with niches and excavations.

The stapes was almost invariably immovable, its body thickened, its side pieces roughened, and once the whole ossicle was transformed into a solid mass of bone.

The histological investigation shows that the affection here consists in *a circumscribed disease of the bony labyrinthine capsule*, as a result of which we have neoplastic bony tissue, which gradually pushes aside the normal bone, and, attacking the oval window and stapes, closes *in toto* the oval window, and produces anchylosis of the stapes. Occasionally the greater portion of the capsule is affected by the disease, as a result of which the neoplastic tissue also extends toward the round window, and toward the cavity of the labyrinth.

The number of cases observed alive, and then examined after death, was sixteen, varying from the ages of 50 to 88. Most of them were totally deaf, some very deaf. It was only in the latter, who could understand a loud voice close to the ear, that the *negative result of Rinné's test* could be established. Exceptionally, the perception for low tones was lost by aërial conduction, whilst the shrill tones of Galton's whistle were often perceived up to the highest limits by those who were not very deaf. Bone-conduction for a loud-ticking watch was observed in but a single case.

The *Mt* appeared, as is generally the case in the aged, dull, thickened, opalescent, often very milky and atrophic.

The *development* of the excessive deafness dated mostly from many years back, bearing much resemblance to the cases usually entitled *dry catarrh of the middle ear* (sclerosis). But any accuracy in regard to the history of the

case or duration of the deafness was excluded, owing to the varieties of replies obtained from the patients.

The chief characteristic of the cases was the constant and *vehement tinnitus.* In some the tinnitus had ceased with the arrival of the total deafness, in others it persisted without intermission. *Sensations of pain* were occasionally complained of, resembling a pricking or tearing within the ear. Heaviness, dulness of the head, loss of memory, occasional vertigo could not be connected with the aural affection, because all of these symptoms could equally well be referred to the advanced ages of the patients, in connection with nervous symptoms.

The *cause* of the affection could not be discovered in any case with accuracy, owing to the low intelligence of the patients. Two of these suffered from gout, but whether in any of the patients syphilis had any causation in the deafness could not be decided.

There is no doubt that pathological alterations in the capsule of the labyrinth, similar to those observed in this series of cases, may be developed subsequent to syphilis, as the observations of Gradenigo show (International Medical Congress in Rome, 1893). I also have no doubt that heredity may play an occasional rôle in these cases of loss of hearing.

HISTORICAL NOTES.

Toynbee's catalogue (London, 1857) contains several specimens which apparently belong to the group of primary disease of the labyrinthine capsule. Among these we observe a thickening and ivory-like condition of the anchylosed plate of the stapes (No. 494), a similar alteration of the bone adjoining the oval window (No. 539), and an ivory-like mass originating from the labyrinthine wall (No. 575).

Moos has described [1] a case belonging to this group. A man of forty-seven who had been growing gradually deaf for eighteen years, became extremely deaf after erysipelas, and totally deaf during confinement in prison. The post-mortem examination revealed anchylosis of the stapes on both sides, from neoplastic

[1] *Archiv f. Ohr.*, Band ii., 1867.

ossification, with contraction of the *internal* meatus auditorius. Moos remarks, that this condition is entirely different from that of the ordinary chronic inflammation of the *Mt* since there are no alterations in the mucous membrane of the tympanic cavity.

The second edition of my text-book on the ear (page 233), contains some remarks on anchylosis of the stapes due to the deposit of newly formed bony tissue on the inner surface of the stapes and the region of the oval window. In this case we find a prominent bony ridge, flattening off towards the plate of the stapes. The same page contains the sketch (the first *histological* observation of stapedial anchylosis) of a horizontal section through the stapes and oval window of a woman of forty-eight, deaf for eighteen years, with total synostosis of the stapes with the oval window. The sketch shows the same alterations as those which I have since discovered to be characteristic of primary disease of the labyrinthine capsule as a whole. In the third edition of my text-book I have mentioned on page 239, three cases of severe deafness with the same set of microscopic appearances.

Katz[1] describes synostosis of the stapes with the oval window in a very deaf woman of thirty-nine. He thinks that it is due to an arthritic diathesis, but from the description I see no reason why the case does not belong to the group now under discussion.

Then again, Habermann, in Schwartze's *system* (page 249) mentions a similar condition in a man of fifty-eight, who had been gradually losing his hearing for thirty years. The exostosis seems to Habermann to be an extension of the inflammation from the tympanic mucous membrane to the bone, but all of the drawings appended to the paper satisfy me that here is still another case of primary inflammation of the capsule surrounding the labyrinth.

The various microscopic preparations which I have made have been verified by Prof. Weichselbaum, and exhibited to a private party of aurists in Boston as well as to the members of the Pan-American Medical Congress in 1893.

Finally I will mention an incident case by Bezold and Scheibe[2] concerning a woman of sixty-five who had been deaf for thirty-five years, with bony anchylosis between the pelvis ovalis and the plate of the stapes. This was due to inflammation of the bone about the plate of the stapes, which, if not in the bone itself, originated probably from the periosteum of the inside of the oval window.

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[1] *Deutsche med. Wochensch.*, No. 40, 1890.
[2] *Zeitsch. f. Ohr.*, Band xxiv., 1893, and these ARCH., vol. xxiii., p. 48.

Before depicting the most typical cases of the entire list, I will say that the specimens obtained in the freshest possible condition were subjected to the action of alcohol and chromic acid, and then gradually decalcified according to Vlakovic's method in a solution of nitric acid and salt.

I shall describe only the most instructive and typical cases with histological alterations.

Franziska, Z., æt seventy-seven, with progressive deafness of many years' standing, but shortly before her death could understand words spoken loudly and directly into her ears. No perception of the audiometer by bone-conduction, no low tones, but high tones nearly to the top of the scale.

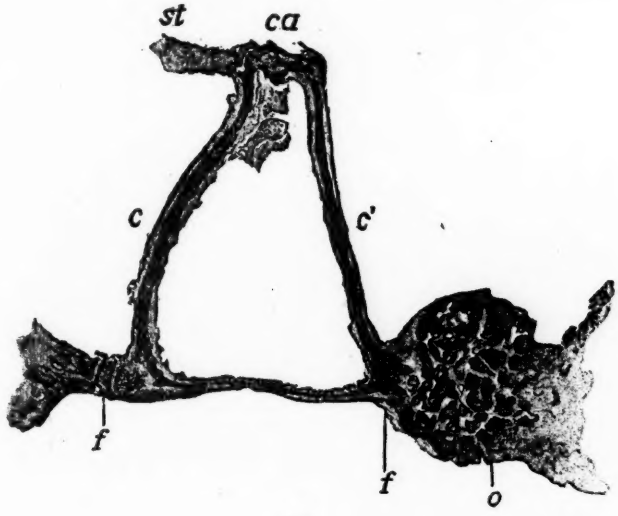

FIG. 1.

Section through the stapes and oval window of a woman of seventy-seven extremely deaf. *ca* = Head of the stapes. *c c* = Crura of the stapes. *st* = Tendon of the stapedius muscle. *f* = Ligament. orbiculare of the stapes, at the posterior section of the oval window. *f'* = Anterior portion of the same, altered in structure. *o* = Neoplastic bony mass in the labyrinthine capsule.

We observe the labyrinthine capsule bounding the anterior section of the oval window supplied by a round sharply-defined formation of bone (*o*), which is set off from the adjoining normal bony substance by the enlargement of the bony spaces and of the Haversian canals, as well as by the

darker stain. The enlarged spaces contain thin-walled vessels and delicate fibrillæ of connective tissue. In some sections the anterior portion of the orbicular ligament is completely pushed aside by the bony mass arising from the labyrinthine wall, whilst in other sections (f') the altered ligament is not entirely lost in the bony mass. The anterior section of the ligament is normal. The mucosa appears normal everywhere. Here, then, we have a partial anchylosis of the stapes with the oval window which explains why the patient could still hear words spoken directly into the ear.

Mrs. W., has been very deaf for many years; æt. eighty-six. Autopsy shows no alterations in the mucosa of tympanum, or *Mt.* Right stapes immovable in the oval window.

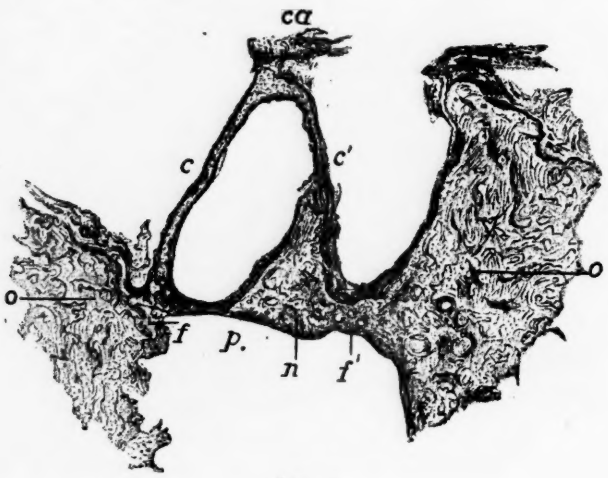

FIG. 2.

Section through the stapes and oval window of the right ear. ca = Head of stapes. $c\ c'$ = Crura of stapes. p = Foot of stapes. $o\ o'$ = Neoplastic bony formation in the labyrinthine capsule. f' = Synostosis of the plate of stapes and capsule. n = Neoplastic bone proliferating from the labyrinthine capsule toward the stapes.

The section shows a bony mass starting from the capsule, sharply defined from the normal tissue, interspersed with enlarged bone cavities and going toward the stapes, pushing aside the ligament, attacking the anterior half of the plate, and filling the angle formed by the plate and the anterior crus. The anterior portion of the ligament is not ossified.

Mrs. A., aged seventy-five, deaf many years. Macroscopically we see on the promontory, near the oval window, a reddish-yellow projecting bony mass, which extends from the window to the Fallopian canal, and is well defined by its color from the pale yellow background of the promontory. These alterations are more pronounced in the left ear.

The microscopic examination of the right ear shows :

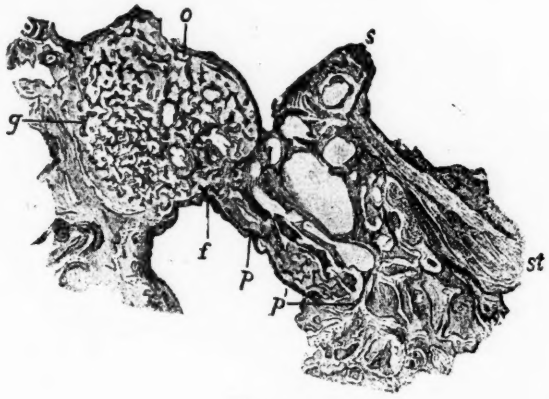

FIG. 3.

Section through the stapes and oval window. s = Head of stapes. st= Stapedius muscle. P' = Vestibular surface of the thickened plate of the stapes. P = Posterior margin of the plate not connected with the window. o = Neoplastic bone tissue filled with vessels, and affecting the entire labyrinthine wall. g = Border between the bony neoplasm and the normal bony tissue of the labyrinthine capsule. f = Synostosis between the plate of the stapes and the neoplastic bone.

The sections show *a sharply defined neoplastic bony formation* with increased thickness of the labyrinthine wall. The anterior portion of the growth is extremely vascular, which may explain its blight tint. The neoplasm attacks, as it did in the previous case, the plate of the stapes, so that in the anterior section of the oval window the stapes ligament has partly disappeared. The plate of the stapes is thickened and altered in structure.

This condition of things explains to my satisfaction those cases in which through the transparent *Mt* we see the very reddish promontory wall. These are characterized by progressive deafness, and generally terminate in total loss of hearing.

Here, too, in such cases, dependent, as I think, largely on heredity, we observe a negative result of Rinné's test, diminished perception for the audiometer and watch, and after prolonged loss of hearing abbreviated perception by bone-conduction for the middle tones of the fork, (c^3).

The clinical course of these cases, resisting all medication, justifies us in believing that these are cases of the above-described disease of the capsule, in which the hyperæmia of the promontory so plainly visible to the eye must be regarded as a symptom of corresponding hyperæmia of the bony labyrinthine capsule. Further investigations may confirm this view.

Katharina B., æt. seventy-five, progressively deaf, and at last totally deaf. Stapes anchylosed by hyperostosis of the walls of the oval niche. The microscope shows the alterations depicted in Fig. 4.

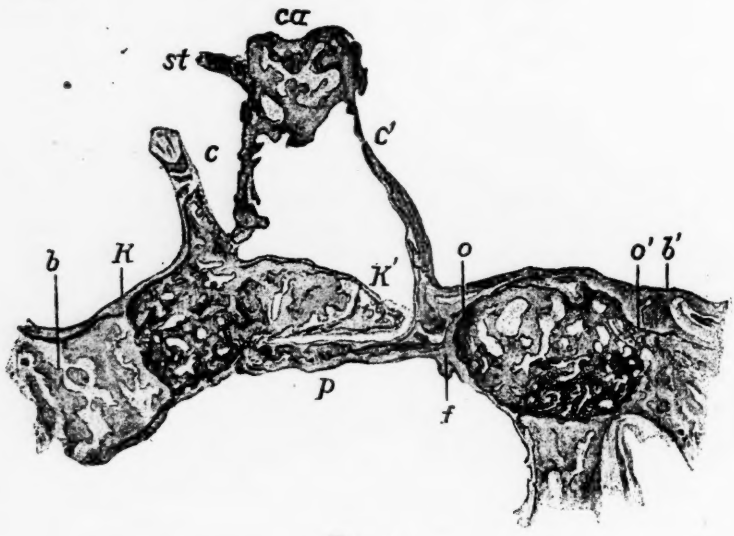

FIG. 4.

Section of the left stapes and oval window. *ca* = Head of stapes. *c c'* = Crura of the stapes. *st* = Stapedius muscle. *p* = Base of stapes. *o o'* = Sharply defined bony formation in the anterior portion of the labyrinthine capsule near the oval window. *b b'* = Normal bone of the capsule. *f* = Synostosis of the plate of stapes and window. *k k'* = Neoplastic bone tissue in the posterior segment of the oval window, proliferating over the external surface of the plate of the stapes.

The anterior segment of the capsule shows a well-defined bony island which has already pushed aside the stapedio-vestibular articulation and is irregularly interspersed with enlarged bone spaces. A similar structure extending into the niche *has overgrown the external surface of the plate.* Mucous membranes normal.

This condition of affairs is important in considering the form of disease now under discussion, since it offers proof that the affection arises from the capsule, and that the bony neoplasm not only attacks the plate of the stapes but proliferates upon its outer surface.

Marie B. was long treated for tinnitus and progressive deafness. Was totally deaf for the last year of her life.

The autopsy revealed anchylosis of the stapes.

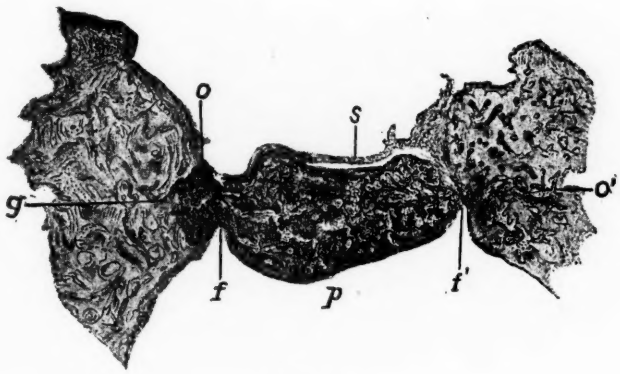

FIG. 5.

Horizontal section through the plate of the stapes and oval window of the right ear. *f p f'* = Irregularly thickened plate of the stapes. *f f'* = Region of the stapes ligament. *o o'* = Neoplastic bony mass in the capsule. *g* = Border between the neoplastic and normal bone of the capsule. *s* = Mucosa of the lateral surface of the plate of the stapes.

This section shows an irregular thickening (to about four- or fivefold) of the plate of the stapes, due to bony formation. The stapedio-vestibular articulation is destroyed in a like manner. That portion of the capsular wall adjacent to the oval window is only partially affected by the neoplasm, which is sharply defined from the normal tissues. At the posterior segment of the window the bone disease extends

into the capsule. The left ear shows similar changes, only the capsule is more affected, whilst the bone cells contain vessels, giant-cells, and osteoblasts.

Simon M., aged eighty-six, has been totally deaf for forty years, the loss of hearing beginning after typhus. No perception of sound by aërial or bone-conduction.

Macroscopically there are no alterations in *Mt.*

Niche of the oval window filled with a bony mass and flattened. The round window is also closed with bone and only suggested by an indentation.

Microscopic sections through the labyrinth show extensive disease of the capsule, embracing almost all of the bony tissue which is interspersed with numerous cavities.

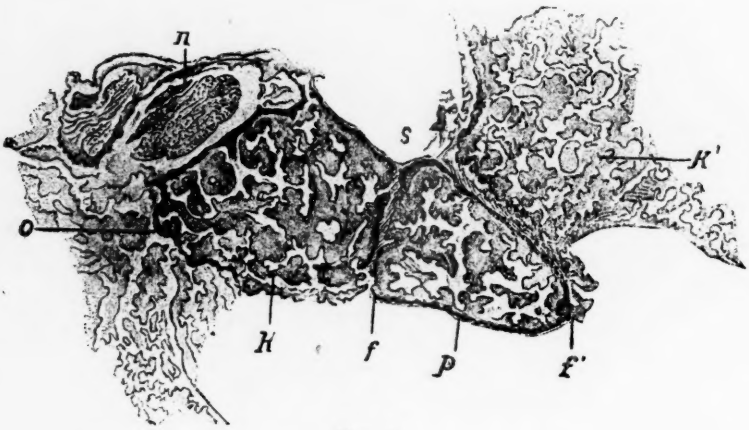

FIG. 6.

Section of the left oval window. p = Former plate of stapes. $f f'$ Region of the former ligament of the stapes. $f s f'$ = Wedge-shaped neoplastic bone, filling the niche of the oval window. $o\ k\ k'$ = Neoplastic bone in the labyrinthine capsule. n = Facial nerve.

The figure explains itself, yet we may add that the niche of the oval window is occupied by a wedge-like bone which is at spots differentiated from the bone of the capsule by a layer of connective tissue, but is connected on the opposite side with the neoplastic bony tissue of the capsule without any sharp definition. The wedge is to be regarded as a neoplasm extending from the capsule toward the niche and destroying the stapes in toto.

The round window is obliterated by newly formed bone which extends into the inferior convolution of the cochlea as far as the lower surface of the lamina spiralis, so that the scala tympani is destroyed. The ganglionic canal and the auditory nerve are also affected.

Theresa D., aged seventy-three, gradual deafness since 1880; death in 1891; previously totally deaf; much tinnitus. Rinné's test negative in the left ear, indefinite in the right. No perception of speech in either ear.

Right ear.—Autopsy: Promontory injected, stapes immovable, and inner portion of the crus of the stapes surrounded with hard mass of bone. The microscopic conditions are shown in Fig 7.

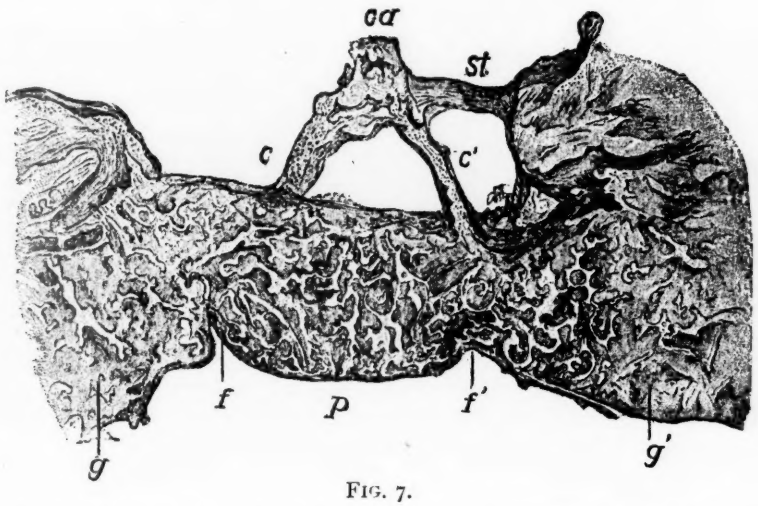

FIG. 7.

Section through the oval window and stapes of right ear. $f f'$ = Former boundary of the oval window. p = The bony neoplasm filling the window. $g g'$ = Pathological bony substance of the labyrinthine capsule. $c c'$ = Crura of the stapes. ca = Head of the stapes. st = Tendon of the stapedius muscle.

The oval window is closed by a neoplasm extending without demarcation into the pathologically altered capsule. The limit of the plate of the stapes is hinted in the indentations f f'. The plate and inner part of each crus have been lost in the mass of neoplastic bone, the rest of the stapes as seen at c' extends directly into the bone. The latter shows the characteristic marks of excessive enlarge-

ment of the bony spaces and Haversian canals, with connective tissue and thin vessels. The alterations in the bone are present throughout the capsule.

The microscopical changes on the right side are seen in Fig. 8.

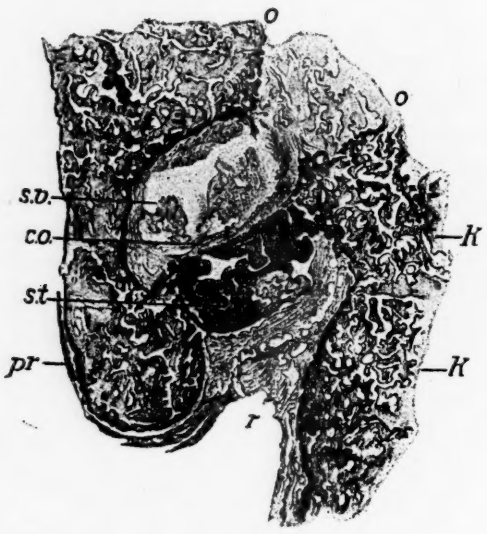

FIG. 8.

Frontal section through the promontory, round window, and the lower cochlear convolution of the left ear of the same person. *p r* = Promontory. *r* = Connective-tissue neoplasm in the niche of the round window. *k k'* = Pathologically altered bony tissue in the lower segment of the cochlea corresponding to the modiolus. *o o'* Slightly altered bony island in the modiolus. *s.t.* = Bony proliferation filling the scala tympani. *s.v.* = Scala vestibuli. *c.o.* = Lamina spiralis membranacea with Corti's organ.

In addition to closure of the oval window and destruction of the stapes as in the right ear we see further alterations in the left ear. Here the bone has extended into the deeper portions of the labyrinth. Only a small portion of the scala vestibuli remains normal, as at o o'. The mucosa of the round window is thickened. The scala tympani is filled with a neoplastic bony mass connected with the capsule extending to the lower surface of the lamina spiralis ossea and membranacea, and pushing aside the triangular ligament. The two laminæ and Huschke's teeth are normal, but Corti's organ is irrecognizable.

A brief review shows us now that the bony tissue of the capsule forming the surrounding of the oval window is changed into a neoplastic bony substance, which is more deeply stained than the normal bone. The variation in color is so marked that it can be seen with the naked eye. Moreover, there are more bone corpuscles and larger bone spaces in the pathological portions than in the normal bone.

The spaces are filled with cells, connective-tissue, and blood-vessels. If the bony neoplasm is young, the spaces are occupied by numerous vessels filled with blood corpuscles. If the neoplastic tissue is older the vessels are there, but empty. A few specimens showed giant-cells, osteoblasts, and osteoclasts.

These observations ought to suffice to show, that in a considerable number of cases which we generally call sclerosis of the middle-ear mucosa, the pathological alterations leading to anchylosis of the stapes do not lie in the mucous membrane at all, but in a primary disease of the capsule of the labyrinth. The proof that the disturbance of nutrition in the bone does not originate in the periosteal or mucous layer, depends on the absence of any alterations in the mucous membrane of the middle ear, as well as on the circumstance that the most remarkable alterations in the bony tissue, the enlargement of the bone spaces, etc., are not discovered near the mucous membrane but in the deeper layers of the capsule itself. In point of fact, in two very recent cases, I found *isolated* diseased lacunæ of bone in the promontory wall near the inner meatus and the cochlea. Moreover, the extension of the process toward the medial portion of the capsule and the internal meatus suggest a primary affection of the bone, since a bone disease extending so deeply into the petrous bone could scarcely arise from disturbances of nutrition of the mucous membrane of the middle ear. If inflammatory processes in the mucosa of the middle ear could excite such alterations in the bony walls of the tympanum as we have here described them, we ought very often to find a morbid condition in the labyrinthine capsule in cases of *non-suppurative chronic middle-ear catarrhs with hypertrophy and thickening of the middle-ear mucosa.* This is, however, rarely the case in the adhesive processes arising

from the secretory catarrhs, and it is questionable whether, in the few instances in which the bone disease together with thickening of the mucous membrane in the window niches has been observed, it was to be regarded as the cause of the bone affection, or as a combination of the two processes.

Most of these cases were in old people, but clinical observations also show that the same disease may produce severe deafness in the young, and that this form, which, owing to its pregnant anatomical character, must be differentiated *from the group of the middle-ear catarrhs*, occurs more frequently than one might feel justified in assuming from the few anatomical reports that have so far been made.

It is well known that other entirely different forms of disease occur with the same progressive deafness, such as calcification and ossification of the stapedio-vestibular ligament, adhesion of the crura of the stapes to the walls of the niche of the oval window, thickening of the mucosa of the membrane of the round window, alterations which have long since been recognized as the sequelæ of chronic middle-ear catarrh. Therefore it will be the task of the future to diagnosticate between the two forms during life. The catarrhal adhesive processes are more favorable in a prognostic point of view, than the form of labyrinthine diseases here described. But even now, from the combination of certain symptoms, we can diagnosticate a labyrinthine disease. Thus we have the insidious character of the deafness, without the slightest token of a preceding catarrhal disease of the middle ear, normal or but slightly retracted *Mt*, visible redness of the promontory wall, normal permeable Eustachian tubes, negative result of Rinné's test, and an hereditary predisposition.

All treatment must be regarded as nearly hopeless. Indeed, we find in the depicted conditions a satisfactory explanation why, in certain forms of progressive deafness, our therapeutical efforts remain without result, and why, in certain forms of disease, entitled dry middle-ear catarrh, the disturbance of hearing advances incessantly in spite of energetic local treatment. Despite the great advances in the treatment of ear diseases in later days we are, face to face with these processes, as powerless as ever, and in con-

sideration of the conditions in the bone, I almost doubt if we shall ever succeed in hindering the alterations in the labyrinth, and terminating the disturbances of hearing therewith connected.

Nevertheless, considering the benefit often obtained from the internal use of iodide of potassium, or iodine, in various diseases of the bones, I would urge that instead of any local treatment we should resort to the energetic exhibition of one or the other of these remedies, internally. It is clear, of course, that in a case of *advanced* neoplastic formation of bone in the labyrinthine capsule even the preparations of iodine will be of no avail, but there is a chance that where the affection is in the initiatory stages the long-continued use of these remedies, occasionally interrupted to relieve the digestive organs, might at the worst prevent too rapid an advance of the unavoidable evil. One gram daily in divided doses for ten to fourteen days, at intervals of a month or two, repeated for a year or more, would be a proper trial in this direction.

In several cases of late in which I diagnosticated neoplastic inflammation in the capsule from the progressive deafness, the reddish reflection of the promontory, the patent tube, and the negative Rinné's test, I have limited the treatment to the use of the iodides exclusively, and the results have been satisfactory where the deafness had not reached a high degree, in that there was no increase of the difficulty.

There is hardly need of my mentioning that this method of treatment is more sure to be of avail in the incipient stages of the disease than where the deafness is already excessive in degree. But further observations will decide the exact value of the iodides in the treatment of this hitherto incurable affection.

In reply to the suggestion that the operative treatment of this disease might be useful, I would say that the hopes excited in late years by the proposed operations on the ossicles have not been fulfilled, since continued observations have shown that the final results have been mostly unfavorable. It is plain that in cases like these under discussion the stapes could only be extracted before ossification had

taken place. If the stapes once becomes fixed in the oval window, the operation will be impossible, because the crura of the stapes will fracture upon the slightest traction. But even in those cases in which an early extraction might be followed by a direct improvement in hearing, we could not calculate on a permanent success. For, having seen that the neoplastic bone formation proliferates toward the plate of the stapes and oval window, and even overlaps the plate from the outside (Fig. 4), it is doubtful whether the early extraction of the stapes could obviate the advance of the bone into the capsule, and the final closure of the oval window. In this point of view Blake's communications at the International Congress in Rome in 1893, in which a noticeable decrease of hearing followed extraction of the stapes in twenty-two cases, are of much interest and weight.

A CONTRIBUTION TO THE SYMPTOMATOLOGY OF RHINITIS CHRONICA ATROPHICA, WITH SPECIAL REFERENCE TO THE AFFECTIONS OF THE EARS.

By Dr. J. MORF, of Winterthur.

Translated by Dr. J. A. Spalding, Portland, Me.

THE atrophic form of chronic nasal catarrh, despite the numerous treatises that have been written about it, is by no means finished and laid aside. If we look over the abundant literature bearing upon the topic, we find a long list of controversial points, not only concerning the anatomical and pathological alterations of the interior of the nose, but concerning the causation and symptoms. Opinions vary enormously, especially concerning the first two points, and it is not at all rare, to see the very same morbid appearance regarded by one author as a cause of the disease, held by another as a symptom of the morbid process, or as a collateral complication. The various forms of post-nasal catarrh were early recognized by many authors, so far as regards their relation to the diseases of the ear, particular mention being made of v. Troeltsch,[30] and Wendt,[33] * but it was Zaufal[37] who especially insisted on the dependence upon ozæna of ear disease. He says: "It is very instructive to observe how affections of the ear, in a very widespread disease, ozæna, depend upon the anatomical and pathological peculiarities of the nasal cavities"; and then adds that he has met some ear disease in about eighty per cent. of all of his cases of ozæna. Further details on the same

* Compare the bibliography at the end of the article.—Trans.

connection between ozæna and the ear can be found in Wyss's dissertation at Berne University [34] to which we will later turn our attention.

Jurasz [13] asserts that he has seen the ear affected twelve times in 170 cases of ozæna. On the other hand, C. Michel [19] doubts any connection of the sort. "Rarely," says he, "have I ever seen a patient suffering with ozæna affected with an ear disease. I once saw a single case of progressive deafness, and occasionally chronic cases of ordinary middle-ear inflammation."

In this state of doubt, I have thought it worth while to exhibit the possible connection in this point of view in the last eighty patients with ozæna at the Basle Otological clinique in the year 1891.

I make no separation between the cases of fœtid or non-fœtid ozæna at this point, for the anatomical alterations, the subjective and the objective symptoms, excepting the fœtor, are common to both forms, and besides that, those cases in which there was no odor at first, might develop that symptom at a later date. Moreover, the line between the two can never be accurately drawn, as one commingles with the other as Jurasz has emphasized. Schech [25] also insists that even if every case of ozæna is not fœtid, yet it is so in all of the well developed cases.

Of our 80 patients, 28 were male and 52 were female. The proportion was, therefore, 35 and 65 per cent. respectively, figures which agree with the general view that ozæna is chiefly a disease of the female sex, as Voltolini amongst others long since asserted.

Contrarily we observe that out of 85 patients seen by C. Michel, 45 were women. This divergence of opinion and percentages may depend on the fact that Michel regards suppuration of the nostrils and the accessory nasal cavities a *sine qua non* in his diagnosis of ozæna, and in this point of view, as Jurasz, Siebenmann [15] and Killian [14] have shown, the sexes are about equally divided. For this reason I have excluded all simple cases of pure suppuration from the accessory nasal cavities.

The age of our patients varied from ten to sixty, the large

majority being from ten to thirty, so that young persons are more likely to be affected with ozæna than the elderly. The frequency decreases rapidly after the age of thirty. The youngest patient was eight, the oldest sixty. Still we must not forget that although there are but few patients under ten, we have no means of knowing precisely when the disease begins.

The most formidable symptom in 72 of our patients out of 80 was the odor, in most cases recognizable at a distance. But the amount of the odor does not always depend on the amount of secretion, which, in the form of pus, greenish-yellow crusts of the nostrils, attaches itself to the posterior wall of the pharynx, and even of the larynx and trachea, for in the eight patients without any fœtor, there was an abundance of crusts.

A single patient assured us that she never had any fœtor except in summer.

The most important alteration is the atrophy which varies in extent and intensity in every patient. If one patient exhibits but slight atrophy of the mucosa of the nostrils, another will show enormous enlargement of the nostrils, and loss of the turbinates, so that they look like mere projections, and one can see, through the enlarged cavities, the posterior pharyngeal space and the openings into the Eustachian tubes without the aid of any apparatus. Moreover, the presence of hypertrophy of the mucous membrane is by no means a rarity, being observed in 18 cases out of our 80. The middle turbinated bone is much more often affected with this form of the disease than either of the others. Four times we saw large mucous polypi hanging from the mucosa of the middle turbinates.

I will emphasize this occurrence of atrophy and of hypertrophy of the mucous membranes in the same individual, because it is denied by some authorities in these diseases. Jurasz found it eight times in 139 persons, whilst Fraenkel,[6] Schech, and Zuckerkandl [36] speak of the frequent transition of moderate hyperplastic nasal catarrh into the atrophic form. In our cases of this combination of hypertrophy of the middle turbinates with atrophy of the rest of the

mucosa there was, in all probability, as recent experience has shown us, suppuration from the accessory cavities of the nose, so that the hypertrophy originated from this latter condition.

We have seen but a single case of *unilateral* rhinitis atrophica, and accompanied with disease of the corresponding ear, a symptom first observed by Zaufal, and cited by him as proof that the aural affection must be regarded as a sequel of the rhinitis and propagated through the tube.

The sense of smell was reduced in 47 cases out of 80, and extended from slight defect to total loss of the sense.

Nearly one half of the patients complained of headache, 33 of them of ache in the forehead, 4 in the occiput, and one in the upper part of the neck. One patient suffered from severe supraorbital neuralgia. Almost always the headache was associated with a sense of vertigo.

Many patients complained of habitual thirst, frequent epistaxis. In the note-books we find frequent mention of sunken broad noses, delicate constitution, anæmia, and indistinct and nasal speech.

Pharyngitis sicca is a constant associate of atrophic rhinitis. It was generally limited in most of our patients to the retro-nasal portion of the pharynx, but occasionally extended to the oral portion. In ten cases the symptom extended into the larynx, and in two into the trachea. In one of the latter cases the thick crusts occasionally obstructed the glottis to such an extent as to produce attacks of stridulous breathing and even of suffocation. Where the larynx was affected, the vocal cords generally exhibited anomalies in tension and in closure.

Deviation of the septum was seen seven times, eczema of the nostrils four, disease of the lachrymal canal twice, and opacities of the cornea twice. Examinations of the visual field showed nothing abnormal. Three patients were affected with hereditary or tertiary syphilis, and thrice a tubercular condition of the lungs was diagnosticated.

Among the complications of rhinitis the diseases of the ear occupy a very prominent position, and special attention was given to them at our clinique. And wherever ocular

inspection failed to give a satisfactory diagnosis of the seat of the disease, an exact functional examination was made. The ears were found affected (excluding of course those of the external ear and auricle because they do not depend on rhinitis atrophica), in 44 patients, which is 55 per cent. of the whole. But if we exclude those in which the *Mt* was not precisely normal, but in which the hearing was intact, we have 38 aural patients out of 80, which is 45 per cent.

Buerkner[6] has calculated that about 30 per cent. of our population do not hear perfectly, and about 40 per cent. have some disease of the ear. If we compare now our 80 patients with rhinitis, we find 47 per cent. are deaf, or a higher percentage than shown by Buerkner on the average. And if we added those who suffered from diseases of the external ear the increase would be still greater, showing a plus of 20 per cent. above the average, when persons suffer from rhinitis atrophica.

Jurasz found but 8 per cent. of aural affections in ozæna, but he counted only those with tubal catarrh and otitis media with or without perforation of the *Mt.* Wyss saw 15 deaf patients out of 60 ozæna cases, and 32 with pathological alterations of the ear without deafness, so that his figures are lower than Buerkner's and Zaufal's, since the latter calculates on 80 per cent. of deafness in rhinitis.

Further investigation shows that as patients with rhinitis atrophica grow older they grow more and more deaf, so that in the third and fourth decades of life almost all the rhinitic patients are also deaf.

The aural disease was located 20 times in one ear, 15 in the right and 5 in the left, and 18 times in both ears. The right ear was consequently affected 3 times as often as the left.

Zaufal having observed that in unilateral disease the corresponding ear was affected, or where both nostrils were affected the ear on that side with greater nasal disease was the most affected with deafness, we might be inclined to think, that in our patients the right nostril was more often affected than the left, but such a distinction we were totally unable to maintain.

Furthermore, Löwenberg has shown that unilateral deafness in men is oftener in the left ear, and in women in the right. From which as 14 of our cases were men and 24 women, we ought to meet with more deafness on the right side than on the left, as has actually occurred.

Division of the ear affections in our patients showed disease of the inner ear in 8, and of the middle ear in 30, which shows an average above the ordinary run of private and clinical cases as established by Bezold, so that we have some justification in referring this *plus* to the rhinitic complication.

If we agree with Zaufal in attributing the aural affection to the closure or irritation of the pharyngeal orifice of the tube by the rhinitic discharges, we have support in our statistics, the tubal orifice being often affected and the other difficulties in the ear being easily due to extension of a tubal inflammation into the middle ear.

If tubal closure is somewhat rare in our cases, it may be due to the disease having proceeded farther into the tube and so disappeared and assumed another form. The reason why we may thus think is, that the frequency of perforations of the *Mt* and of Shrapnell's membrane prove that there has been, previous to the perforation, some disease of the tube, as Bezold[3] has abundantly proved.

We must also emphasize the frequence of nervous deafness (8 cases out of 80, nearly double the amount in comparison with the statistics of other observers). Nevertheless this may be partially accounted for by the variations of the definition of nervous deafness as employed by different observers. If our percentages are correct, we must ascribe to the rhinitis, as well as to the nervous deafness, some constitutional ætiology, such as syphilis, tuberculosis, or infectious diseases which affect alike the nose and the inner ear.

A general review of the whole subject shows:

That chronic atrophic nasal catarrh attacks chiefly young people.

That women are more often affected than men.

That the secretion in 90 per cent. of the cases is fœtid.

That a unilateral disease is extremely rare.

That where the middle turbinates are hypertrophied or covered with mucous polypi, the case is complicated with suppuration from the accessory nasal cavities.

That the naso-pharyngeal mucosa is often affected, and that of the larynx and trachea much more rarely.

That the eyes are rarely affected.

That disease of the middle and inner ear is a frequent complication.

That the middle ear is four times as often affected as the inner ear.

That pathological alterations in the *Mt* without deafness are rare.

That the sex has no influence on the frequency of the aural affection, in general, but that the right ear is oftener affected in women, and the left in men.

That in about one half of the cases of aural complications, both ears are attacked, and in another half only one ear. In the latter circumstance the corresponding half of the nose is more diseased than the other.

That nervous deafness is relatively more frequent in atrophic rhinitis, despite the fact that most of the patients are relatively young.

That the middle-ear disease is generally the consequence of disturbed tubal ventilation, and that the affection of the inner ear must be referred to constitutional anomalies.

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ON MONAURAL DIPLACUSIS.

By Prof. G. GRADENIGO, Turin.

Translated by Dr. Ward A. Holden.

DIPLACUSIS or double hearing is not a particular form of disease, but a symptom that may be found with pathological conditions of the ear. We distinguish between binaural and monaural diplacusis; in the binaural, each ear perceives the tone differently and it seems doubled; in the monaural, which is much rarer, a double perception of a single tone is got by one ear alone.

Binaural diplacusis may be divided into (1) *Disharmonic diplacusis*, which is characterized by the fact that the interval is small between the objective tone perceived by one ear and the false tone perceived by the other, it being only a half- or a third-tone. The false tone may be higher or lower than the other. This symptom is found particularly with the perception of tones of the middle register. In thirteen cases reported exactly and in detail in the literature, the false tone as related to the objective tone was:

$\frac{1}{2}$ to 1 tone lower, 3 times.
$\frac{1}{2}$ to 1 tone higher, 7 times.
$\frac{1}{2}$ to 2 tones higher, 2 times.
$\frac{1}{3}$ tone lower for high tones, and
$\frac{1}{3}$ tone higher for low tones, once.

This form occurs with slight alterations of the internal ear, which may accompany acute or relapsing chronic processes in the middle ear, or which may be the beginning of true inflammation of the internal ear.

(2) *Harmonic diplacusis*, in which the interval between the objective and the falsely perceived tone is harmonic, being an octave, a fourth, a fifth, or a sixth, above or below the objective tone. In this form the actual difference in the perception of the two ears is not in the tone but in the timbre, one or more harmonics being perceived with greater intensity than the fundamental tone. This form of diplacusis is usually absent when the hearing is tested by bone conduction. The cause of the intensification of the harmonics simulating a different tone, lies in the middle ear, and depends, in all probability, either upon a modification in the vibration of the conducting apparatus, due to cicatrices, partial atrophy of the tympanic membrane, changes in the tension of the muscle, etc., or upon peculiarities of resonance in the tympanic and neighboring cavities. The internal ear is usually intact. In this category are the cases of Treitel, Spalding, and two observed by me.

With both forms of diplacusis there may be associated *binaural echoic diplacusis*, a condition in which the perception of the objective and of the false tone seems separated by an interval of time. One of my patients who suffered with disharmonic diplacusis stated that he received the impression that would be got if two persons spoke the same word in different tones at the same time.

Monaural diplacusis has not been treated in literature, and since I have had the opportunity of observing two cases of this sort, one being in an educated musician, I wish to report them briefly. This form is analogous to binaural harmonic diplacusis. The affected ear perceives not only the fundamental tone, but, particularly when the fundamental is not intense, one of the harmonics also, so that in the one ear there is a doubled and synchronous perception of sound. This phenomenon, like the analogous binaural diplacusis, depends, probably, upon anomalies of the conducting apparatus, or peculiarities of tympanic resonance.

W., male, æt. twenty-nine, a violinist and composer, has catarrhal otitis media in the left ear and in a milder form in the right

also, with retraction and atrophic patches in both tympanic membranes. There are no symptoms pointing to disease of the internal ear. D. V. left; hearing almost normal, right. On both sides, but more markedly on the left, the following phenomenon may be made out. When a fork of middle or higher register is held before the ear, the tone is heard single, so long as its intensity is great; but as the intensity diminishes a second tone is clearly heard, which is usually harmonic and represents a higher or lower major or minor third or quarter. The interval varies with different fundamentals, but is constant for the same tone. This phenomenon is also obtainable by bone-conduction. Besides the diplacusis I found the physiological condition described by Urbantschitsch well marked, namely, that a given tone seems lower as it is more intense and higher as it grows weaker. Thus the tone g^2 which was heard normal for forty-five seconds by the right ear, seemed more than a half-tone higher as its intensity diminished. This was not the case with lower tones.

A second analagous case was observed in a woman of twenty-eight with catarrhal otitis media on both sides, without marked changes in the tympanic membrane, and with involvement of the internal ear. The forks c^3, c^4, and c^5 were heard double in the last ten seconds before the perception ceased. The patient, who was not musical, could not give the interval between the true tone and the false, but it was harmonic. It is not impossible that this form of monaural harmonic diplacusis may depend upon exaggerated physiological conditions, whereby with the excitation of the percipient elements corresponding to the fundamental tone there is associated the excitation of other groups of elements that stand in some relation with the first, such as customary consonance. Such a diffusion of the excitation might take place in the labyrinth, or as in the case of colored hearing, in the cerebral centres.

ON DOUBLE HEARING.

By Dr. HANS DAAE,

FIRST ASSISTANT IN THE CLINIC FOR DISEASES OF THE EAR AND NOSE, GOVERNMENT HOSPITAL, CHRISTIANIA, NORWAY.

Translated by Dr. A. B. Kibbe, Seattle, Washington.

THAT functional disturbance is known as double hearing which consists of hearing a single tone double. The two tones differ from one another either in time (diplacusis echotica) or in place (interval), and according as the interval is harmonic or discordant we speak of "diplacusis harmonica" or "disharmonica." From time to time cases of double hearing have been reported, and occasionally a discussion has arisen on this symptom. That is, the probable explanation of the disease has been discussed in that a few believe that the double hearing is to be attributed to changes in the middle ear, others to the internal ear, while there are still some who ascribe it to central disturbances, each of these three explanations being supported by clinical observation. As examples may be cited: For an exclusively middle-ear affection Treitel's second case,[1] in which the double hearing arose from a rupture of the membrana tympani and disappeared when the rupture healed. As an exclusively internal-ear affection Treitel's first case,[2] where fatigue of the percipient organ followed long-continued use of the telephone. For a more centrally located cause Swan Burnett's case may be mentioned.

In addition to these a large number of other cases have

[1] *Archiv für Ohrenheilkunde*, xxxii., p. 218.

[2] *Archiv für Ohrenheilkunde*, xxxii., p. 217.

been described, of which a few clearly depend on middle-ear disease, though even here internal-ear affection can scarcely be excluded. On the contrary, in the majority of these cases, disturbances in the perceptive organs may be pointed out as the accompanying and even most essential symptoms existing along with double hearing. Lastly, a few cases have been described of a very puzzling kind, as well with reference to the symptoms as to the location of the affection. Van Selm's [1] case, for instance, is so complicated that one cannot be certain whether it is an ordinary diplacusis binauralis or not.

It is stated that the tuning-fork C by bone-conduction was perceived as two tones "of which one was deeper and weaker, the other higher and stronger." The patient alleged that the higher tone corresponded to C. In addition, by bone-conduction A was heard in the right ear as two tones, a high, normal, a deep pseudo tone; the left ear was similarly affected. The same applied to C occasionally. This points to a form of diplacusis monauralis, even if it be not identical with a symptom described by Gradenigo under the same name.[2] Strangely enough it will be observed in Swan Burnett's case that bone-conduction gave a double tone, and yet the diagnosis of a central affection was made. On the whole, there appears unfortunately to be too little complete material available to locate exactly the seat of the disease which manifests itself by the symptom of double hearing.

The diagnosis of the seat of ear diseases, whether in the sound-conducting or sound-perceiving apparatus, is commonly difficult and often the result of an estimate of probabilities. Still more difficult is it to decide whether double hearing is to be localized in either the former or the latter mentioned apparatus. Also if for example the majority of the symptoms necessitate the diagnosis of middle-ear disease it is still not certain that double hearing present on both sides is to be taken as dependent on middle-ear disease. This symptom may quite easily depend on a secondary

[1] Zur Casuistic des Doppelthörens, *Inaug. Dissertation*, 1889. See the preceding number of this volume.

[2] *Zeitschrift für Ohrenheilkunde*, xxiii., p. 251, 1892.

change of the perceiving apparatus similar to other well-known symptoms of internal-ear disease in connection with catarrhal affections of the middle ear.

If, therefore, in a given case when from the majority of the symptoms the diagnosis of a middle-ear affection has been established, double hearing by air-conduction is found so that the healthy ear perceives the correct tone and the affected ear the false one, but double hearing by bone-conduction is absent, one is justified in attributing the double hearing to an affection of the sound-conducting apparatus.

In the previously described cases this examination was either not made, or, if so, sufficient attention was not paid to it. The diagnosis in consequence was made from other symptoms entirely. It is safe to conclude, therefore, from the previous cases, that the diseases of the middle ear may be diagnosed with certainty even though the symptoms of diplacusis appear to be present as a consequence of a simultaneous affection of the perception apparatus.

The question therefore arises whether middle-ear disease alone can cause double hearing. According to my ideas this is possible, as well from the fact that cases are recorded in literature which substantiate this, and I myself have observed several such instances.

D. T., thirty-two years of age. Two years ago he fell on the ice. A few drops of blood flowed from left ear, and at the same time giddiness and deafness set in with a strong high-pitched hissing with now and then a sound like the chirping of a grasshopper. These symptoms gradually disappeared. Since this fall he has been unable to tolerate music, especially wind instruments. The left ear perceived the tones as a scratching of metallic substances against one another, and though he heard the tones at the same time they were lower than in the right ear. If music is faint he hears it pure. His appreciation for music is fairly good. The left drumhead presents nothing abnormal excepting slight retraction with peripheric shortening of the light spot; especially was there no cicatrix to be discovered. The right drumhead was quite normal.

	watch	whisper	Weber	Rinné	Galton
R	normal	normal	256	+50	10–0.9
L	$\frac{1}{3}$ *m*	6.5	indiff.	+50	10–1.0

Treatment: multiple incision in the central slightly relaxed portion of the left drumhead. Patient afterward disappeared. Six months later he returned and stated that the singing did not annoy him so severely as before the punctures. Examination with the tuning-fork showed tones to be perceived equally in both ears by bone-conduction. By air-conduction, on the contrary, the vibrations below 100 were scarcely heard. From 100 to 4096 the tones were heard a fifth lower in the left than in the right ear. 4096 was not heard as a tone but "as a whistle going through the head."

Galton 10–0.9 right; 10–1 left.

Treatment: catheterization and air douche.

After four treatments he recovered completely. Music was heard, though not perfectly; occasionally some discord, as he imagined. Otherwise he perceived the tone slightly weaker on the left than on the right side. At the same time a change in the interval from a fifth to one half tone took place. Other symptoms were the same as in the previous examination. Recovery permanent.

Here we find diplacusis by air- but not by bone-conduction. Treitel's case II, as evidence that double hearing may depend on middle-ear disease, does not appear to me unquestionable. Among other things there is no support for the diagnosis in the shape of an examination with the tuning-fork.

What change it is in the middle ear which in my previously described cases has given rise to double hearing I do not know, nor has it been demonstrated in the majority of the published instances of middle-ear affections with double hearing. The retracted drumhead, however, the altered relations of resonance, and above all the moderately certain existence of diminished mobility in the sound-conducting apparatus may well indicate the origin of double hearing.

It appears questionable to me whether the restricted mobility may not alone be sufficient, for exactly in these cases does middle-ear massage appear most agreeable and useful.

The changes in the perceptive apparatus which should produce double hearing have already been declared to be according to Helmholtz's theory dependent on either in-

creased relaxation or tension of the fibres of the membrana basilaris. This explanation, however, is not always sufficient. For instance, I have observed a case in which Helmholtz's theory was insufficient, Voltolini's, on the contrary, seeming to be more appropriate.

Mr. M. In the course of a few years a constantly decreasing power of hearing in the right ear had occurred following a chronic middle-ear catarrh. At the present time he hears almost nothing.

In the left ear he had had a catarrhal affection which disappeared after a time under treatment with the air douche.

Double hearing was discovered quite accidentally at the examination, it having never annoyed him. In the right ear he hears beating noises which he pointed out on the piano as *f*. In addition he has coarse pulsating hissing and occasionally fine whistling. These sounds are stronger in the recumbent than in the erect position. No giddiness or headache. Now and then radiating pains in the right ear. The drumhead of the right ear gave the impression of a chronic catarrhal affection of the tympanic cavity.

	watch	whisper	Weber	Rinné	Galton
R	0	10 *cm*		+8	10–1
L	normal	normal	indiff.	+30	10–1

By bone-conduction the fork is heard equally on both sides. Through the air, however, the relations are different in that tones of 60–128 are perceived correctly and with equal intensity in both ears. From 128–2048 the tones are perceived on the left side as one and the same tone, namely, f′, that is, the subjective tone. Above 2048 the tones are correctly heard and on both sides alike.

The left ear becomes fatigued more quickly than the right. A few days later he was examined anew without being treated. The conditions were as at first, excepting that neither 2048 nor 4096 could be heard on the left side ; those below and Galton's whistle, on the contrary, being well perceived. Unfortunately I had no opportunity to treat him, as he became confined to bed from other diseases and died later on.

As stated, Voltolini's theory seems to be more applicable to this case. According to his theory, each tone excites all fibres of the membrana basilaris, but one fibre, that appropriate to the given tone, more than the others. In my case

it appeared as though fibre *f* was the most irritable and dominant one, owing to the weak impression made on it by other tones than *f*. The localization of double hearing in the middle or internal ear respectively, according to the presence of harmony or discord, as proposed by Gradenigo, is difficult to defend, as long as the boundary line between harmony and discord is so inexact. In addition, it is apparent that in harmonic, as well as in discordant double hearing, bone-conduction points sometimes to middle, at other times to internal, ear affection. Equally may we have at the same time discordant double hearing in one part, and harmonic in another part of the scale.

In this connection permit me to report a very interesting case:

A. J., assistant, sixty-one years of age. During the past five years the hearing in the left ear has gradually decreased, being worse after taking cold. Three years ago he was treated by a specialist with the air douche, following which he was better for about six months.

Other symptoms during the five years were:

1. Giddiness, particularly during a noise. A wagon rolling noisily by caused a tendency to fall to the left.

2. Continued hissing like escaping steam, accompanied by numerous tones, principally high, though some very deep, which he felt like a vibration deep in the ear, almost as if a vibrating tuning-fork were being moved to and fro in front of the meatus. The vibrations were 280 per minute (pulse 84).

3. Autophony occasionally on the left side.

4. In addition a cracking in the left ear in swallowing.

Status præsens. The left drumhead bears evidence of a chronic catarrhal affection. In addition there is a chronic nasal catarrh with hypertrophy of the mucus membrane.

R	watch	whisper	Weber	Rinné	Galton
	0.5 *m*	11 *m*	256	+45	10–1.3
L	ad conch.	1.5 *m*	1 (as c′)	+25	10–1.3

By bone conduction 2 tones are heard; a stronger one in the sound ear, a weaker in the diseased one. If the tuning-fork is carried 1 *cm* from the sagittal suture toward the affected side, it is heard strongest in the diseased ear. The tone which is heard

by the sound ear is the correct one for all tuning-forks. He hears it on the affected side $2\frac{1}{2}$ tones lower than its actual pitch. Forks from 64 to 4096 vibrations were correctly perceived by the right ear, while in the left those of from 64 to 2048 vibrations were perceived $2\frac{1}{2}$ tones, and from 2048 to 4096 $3\frac{1}{2}$ tones lower.

Here we see diplacusis binauralis disharmonica, but the disharmonic interval varies for different tones. In spite of the fact that the double hearing here presumably depended on an affection of the perceptive organs, treatment was directed to the chronic middle-ear catarrh. After a few treatments by the air douche the interval nearly disappeared, in that

from 64–100 there was a difference of $\frac{1}{2}$ a tone,
from 128–256 of 1 tone,
and from 526–4096 no difference.

This was interesting from the fact that the interval decreased with the height of the tones; which was opposite to that which was the case in the first examination.

The treatment was continued eight days longer, when examination showed that double hearing had returned. Tones of 64 to 100 gave a difference of $1\frac{1}{2}$ tones, therefore a discord. From 128 to 4096 there were 3 tones difference, the interval being harmonic.

After being twice treated with vapor of sal ammoniac the perception in the deep octaves was uncertain—

c' (256) being perceived as $g^{\sharp}$ (discord),
c'' (512) as a (harmony).

After each treatment the interval decreased, and eight days later had entirely disappeared; single hearing existing, which was retained in spite of the fact that, later, hearing in the left ear decreased. Occasionally he has been treated with Delstanche's rarefier, which "relieves" him markedly. This case is interesting as showing clearly the impossibility of localizing discordant and harmonic double hearing, as Gradenigo asserts, in affections of the tone-perceiving and tone-conducting apparatus, respectively. In addition, double hearing existing as well by bone- as by air-conduction makes the case noteworthy.

It is probable that the double hearing in this instance, as well as many other symptoms, must be referred to the perceptive apparatus. In this locality, however, most of the symptoms are secondary, and depend on chronic middle-ear trouble. Especially is this likely to be the case with the double hearing, as it disappeared when treatment was directed to the middle ear.

The results at which I have arrived by including reported cases with those which I have observed are that double hearing may arise:

1. From affections of the sound-conducting apparatus.
2. From affections of the sound-perceiving apparatus.
3. That in a few cases where double hearing has been declared to depend on affections of the perceiving apparatus, the real affection was in the middle ear, treatment of which would have caused the double hearing to diminish or disappear.
4. That harmonic as well as discordant double hearing may depend partly on affections of the inner, partly on affections of the middle ear.

HEARING FOR SPEECH AND HEARING FOR TONES IN GENERAL, AND THE MEASUREMENT OF THE LATTER BY GRADENIGO'S AUDITORY FIELD.

By Dr. H. ZWAARDEMAKER, of Utrecht.

Translated by Dr. A. B. Kibbe, Seattle, Washington.

IF in this short article we contrast hearing for speech and hearing for tones, this does not happen because we imagine a distinction between speech and tones in an acoustic sense. We need not make the fact particularly prominent that we too think of speech as composed of tones and noises which approach us in characteristic association and varying order. We shall even go a step further and assume that, physiologically speaking, tones and noises may be mixed together, in that both, analyzed in Corti's organ, are perceived by the same nerve endings.

If we take the stand defended by Exner, Brücke,[1] and Gad,[2] the tones of our music as well as the tones and noises of speech are all without exception analyzed and perceived by similar sensory elements.

It is the fibres of the membrana basilaris which are caused to vibrate in unison, and it is the terminals of the ramus cochleæ which are irritated by these fibres. A functional disturbance which decreases the sensibility of the ear for tones must therefore diminish the sensibility for speech,

[1] E. Brücke: "Über die Wahrnehmung der Geräusche," *Sitzungsberichte der K. Academie der Wissenschaften zu Wien, math.-naturw.-Kl.*, Band lxxxx., S. 199, 1884.

[2] J. Gad in Schwartze's *Handbuch der Ohrenheilk.*, 1 Bd., S. 351.

provided that the disturbance is connected with those elements concerned with the appreciation of the tones and noises of speech. It often occurs, however, that the decrease for speech is more marked than that for tones. This may be the case even if it can be shown that it is just those tones which are comprised within the limits of speech that have remained intact. As a consequence the disturbance must not be attributed to the perception of the component elementary impressions, but the difficulty must rest in their sequence and rapid change of intensity and pitch. It appears very important to collect further experiences on this point, and I have therefore looked about for methods to estimate as simply and completely as possible in all cases of ear disease the decrease in hearing for speech as well as for the scale of tones.

For speech this task seems very simple. In his method of applying conversational or whispered speech as a measure of the acuteness of hearing, Oscar Wolf has given us a means as easy as it is certain of estimating the sensibility of the ear for both of these. In America the use of a fraction to designate the results obtained was recommended long ago. The denominator denotes the distance at which normal individuals hear the sound. For whispered speech this is estimated by Wolf at 18 *m*, according to military requirements at 23 *m*. The numerator denotes the distance at which the person examined actually hears the sound. It is questionable whether one is justified in assuming as normal so great a distance, which only applies to very excellent ears. The normal standard, according to anthropometric requirements, is not the maximum value, but rather that which exists in the majority. A second and far more important objection is that the fraction form of estimation implies that the sensitiveness of the ear is inversely proportionate to the distance.

Apparently this is not the case. Natural philosophy teaches us that the intensity of sound decreases in inverse ratio to the square of the distance. The theoretic conditions which must be fulfilled if this law is to hold good, are seldom realized in nature, in our rooms never. For first the ground is quite near the ear as well as to the source

of sound. The sound waves, therefore, are able to spread only from the floor upward. Downward they strike the floor and according to its conditions are only more or less incompletely reflected. In addition there are the walls and ceilings of the room, which act in a similar way. If the floor is covered with carpet, the waves are but feebly reflected, and the same occurs if many instruments and pieces of furniture are placed in the vicinity. It is no wonder therefore that practically sound does not decrease in inverse ratio to the square of the distance, but rather in simple proportion. Under these circumstances it is really impossible to find a simple relation, and one applicable to all places between sound intensity and distance. Our error is less if we assume for our rooms a simple inverse ratio, than if we apply the theoretical law. The description, therefore, by aid of a fraction is, *cum grano salis*, correct.

Without question it is practical in estimating the auditory acuteness for whispered speech to make use of the fraction, and to use as denominator of the same Wolf's normal distance of 18 *m*. It is necessary to always be aware that many inaccuracies are included in this form. These are, however, presumably less than the uncertainty which exists in the estimation of the acuteness of hearing by whisper or speech in general, for not only does the intensity with which the whisper is made vary, but the carrying distance of the latter changes considerably with the choice of words, as the author of the method, O. Wolf, indicated in his first publication (*Sprache und Ohr*, Braunschweig, 1871). An effort was made, as is known, to avoid this difficulty by making note of the words used at the examination. It is plain that then a comparison is only permissible between estimates which have been made with identical series of words, which again introduces psychological sources of error.

In short, by using the fractional form according to custom, we obtain an approximate measure of the acuteness of hearing for whispered speech. In our examinations we shall make use of this method, though we can only give a provisional value to the results so obtained.

A. Goldschieder and R. F. Müller have lately written an

excellent article on the physiology of reading.[1] It was shown that we always sacrifice certainty to rapidity. We never analyze exactly the written characters, but rather grasp a few characteristic strokes and compare these with memory pictures. If the similarity between both seems to be sufficient, we take them to be identical and pass on to other characters. We do not halt at each letter, but choose a few which appear particularly prominent in the word. These we assemble at a glance and complete the word from memory. In this way reading progresses rapidly, but the danger of error is very great.

In the same way we act with hearing. From the vowels and consonants which compose a word we seize upon a few determinating sounds and noises. On these fragmentary impressions we attempt to rest our memory pictures, and, if in keeping with sense, we believe we have understood the word. From this cause arise the mistakes which we daily hear our patients make. Determinating sounds are probably first the vowels and second the easily heard consonants. Among the vowels there are again some which through their intensity are particularly prominent, and, as it appears to me, they are those in which the mouth is most widely opened; above all stands *a* (as in *far*). We make the least demands upon our patients therefore in testing them with whispered speech, if we choose words in which the greatest possible number and of most clearly determinating sounds are present. In this way we shall seek to estimate the acuteness of hearing for speech in every case.

The estimation of the acuteness of hearing for tones does not seem at first sight equally difficult. We do not need to learn the acuteness for individual tones, as Lucae does with his tuning-fork with a mechanical striker, or for a certain sound as does Politzer with his absolute acumeter, but rather desire to know the acuteness of hearing for all tones of the scale. It is apparent that we shall not have to carry out such estimates for all tones of the ordinary chromatic scale. We shall always be obliged to restrict ourselves

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[1] *Zeitschrift für klinische Medicin*, Bd. xxiii., S. 1 und 2.

to a few points in the scale, in such a way that we can presume on finding the interlying steps by interpolation. Hartmann for example has chosen for this purpose the note at the beginning of the octave c, c^1, c^2, c^3, c^4. Gradenigo has added C and c^5. Late researches, however, through which the upper and the lower part of the scale have become of such great importance, necessitate for the completion of the series in addition to the estimation of the upper and lower limits C—2, C—1, C, c, c^1, c^2, c^3, c^4, c^5, c^6—that is, not less than twelve measurements. This is exceedingly complicated and requires too much from the patience of those examined. For certain scientific examinations this tedious measurement cannot be avoided. For practical purposes, however, it is necessary to simplify the method.

I arrived at this purpose by dividing the scale into four equal parts which present the advantage of being natural tone groups.

1. The zone of contra octaves.
2. The chest register of the singing voice.
3. The zone of the vowels.
4. The zone of the high guttural consonants.

Each of these zones or groups of tones, which possess a close relationship with one another, may permissibly be studied separately in another manner. Concerning the upper and lower zone we shall be informed during the aural examination by aid of forks, rods, and the Galton whistle; the second may be tested with a harmonium; and finally concerning the third we have in the whispered voice a very exact criterion. We thus get a general idea of the character of the different parts of the scale and need to establish but few actual measurements in order to be able to form a correct quantitative representation. It is obvious that these should be made at the dividing and terminal points of the zone. Therefore measurements were taken at

1. The lower boundary tone.
2. C.
3. c^2.
4. $f^{\sharp 4}$.
5. The upper boundary tone.

The previous examination having given us a general view of the more or less continuous character of the function within the zone itself, it is possible by aid of the quantities now found to construct a curve which will represent the acuteness of hearing for all tones.

This curve, in fact, gives such a representation, provided that the sensory acuteness is equal for the various tones, in other words, that there are no so-called tone gaps. In the majority of the cases examined this proviso will suffice. Should it not, we still always have the Hartmann-Gradenigo method and Bezold's examination of the continuous-tone series. I felt forced to adopt the simplified method, because in the construction of a curve for all cases examined in the Polyclinic, a great scientific gain was to be found, *for in the relative area of the space inclosed between the curve and the axis of abscissas is found a simple positive denotation of the acuteness of hearing for tones in general.*

Gradenigo has given this space a particular name. He calls it the "auditory field." After we have fully determined its upper and lower limits, Gradenigo's auditory field is an actual measure for tone-hearing in general. The question now arises as to the manner of estimating the sensory acuteness for the selected points of the scale. The upper and lower limits are decided upon by the previously given method[1]; the lower boundary, by aid of tuning-forks and Appunn's lamellæ,[2] latterly also and by preference with Moos's iron forks; the upper limit calls for the Galton whistle. We seek to produce the boundary tones as pure, but at the same time as even and as strong as possible. In the vicinity of the upper and lower tone-limits the sensitiveness of the ear becomes progressively less. Beyond the boundary tone the acuteness of hearing is zero.

The three other points of the curve, for which we chose c, c^2, and $f\sharp^4$, are only accessible for measurement if tuning-forks or the wide organ pipes are used. All other sources of tone give compound and not simple vibrations and com-

[1] *Zeitschrift f. Ohrenheilkunde*, Bd. xxiv. S., 280. Translation, ARCH. OF OTOL., 1894, p. 228.

[2] *Arch. f. Ohrenheilkunde*, Bd., xxxv., S. 299.

pound tones are to be absolutely excluded in our examinations. Of the two sources of tone I prefer the tuning-fork.

In order to produce a constant stroke, the fork is supplied with Lucae's hammer; we are thus in a position to give to it the same initial amplitude at all times, and the hammer always strikes with the same amount of living force against the same point of the tine. There is therefore nothing to prevent using the time of hearing as a measure of acuteness of hearing. It is only necessary to hold the fork freely in the hand so as to permit its vibrations to die out always in the same way.

The amplitude of the stroke applied to the tuning-fork is the measure of the intensity of sound which is evoked from the fork at that moment. To estimate the acuteness of hearing it is only necessary to bring the fork quite near the ear and note the instant that the tone is no longer heard.

If at this moment the amplitude of the vibration is known, we know also the acuteness of hearing for the respective tone.

Concerning the manner in which the results of such measurements should be compared with one another, opinions differ. Jacobson believes that the actual acuteness of hearing under these conditions is inversely proportionate to the square of the amplitude. Hartmann, on the contrary, prefers a simple inverse proportion, and later cites in support an experimental examination of Stefanini.[1] However that may be, for the present, as far as I can see, we shall do better to follow the customary opinions and, until we have been taught better, presume that the physical intensity of tones is proportionate to the square of their amplitudes. In this manner we arrive at a fairly simple expression of the relations between two given estimates of hearing.

In this form of observations it is quite important to proceed always in the same manner. Sufficient time should be allowed the patient to fix his attention on the weak tone of the fork; on the other hand, fatigue of the ear should be avoided. We have always made the test by carrying the

[1] Stefanini, cited in *Beiblättern zu Wiedemann's Annalen*, 1888, S. 320, and 1889, S. 871.

fork to the ear and waiting until the patient clearly appreciated the tone. The fork is then removed and in the next instant again brought in the vicinity of the ear. In this way we proceed slowly until told by the patient that the tone is no longer heard. From the instant perception ceases to the time when we are so told, a certain time elapses which, from lack of practice on the patient's part, may be relatively great. This may, however, be greatly diminished by repeated testing. If the estimate must be made without forks supplied with a springing hammer, Gradenigo's plan may find place. He recommends in Schwartze's *Handbook* not to measure the hearing-time of a patient, but rather the time which the normal ear hears the fork after the diseased ear has ceased hearing. By subtraction the real hearing-time is found, and one is freed from the irregularities due to striking the fork with the hand.

In whatever way the fork is used, overtones are to be avoided. In the fork $f^{\#4}$ these cause but little disturbance, as at this point they are much more weakly heard than the fundamental tone. The hearing-time for the normal ear we have set at 17 seconds. With C the overtones are, on the contrary, often stronger than the fundamental tone, and their suppression is very difficult. I succeeded, however, by the use of cloth rings as dampers, 10 *cm* in length, which were shoved over the ends of the tines (the latter were 30 *cm* long on my fork). In order that no overtones should be heard, it is necessary to shove the cloth casing forward a little (on my fork they extend inward $2\frac{1}{2}$ *cm*).

The hammer, 25 *cm* in length, strikes immediately below the cloth ring. In this way a perfectly pure, deep humming is produced, which is heard by a normal ear for a little less than 100 seconds, and which, by aid of the graphic method, was estimated to be a tone of 64 vibrations. The c^2 fork was dampened by a cloth ring $2\frac{1}{2}$ *cm* in length, placed at the foot of the tines, and gives a normal hearing-time of 60 seconds. In histories of cases I always denote the duration of hearing in seconds.

As stated, the ultimate purpose of our method is to obtain a curve which shall show the acuteness of hearing for all

tones of the scale. To construct this curve, I first calculate the duration of hearing in percentages, according to Hartmann, and make the squares of the latter the ordinates of a system of co-ordinates. This latter will be most practically constructed if the tones of our chromatic scale are placed on the axis of abscissas, and in addition are arranged like the key-board of the piano, the lower tones to the left, the higher to the right. If for each half tone we calculate 1 *mm* we get, for the entire scale in youth which reaches from E^{-3} to E^{7}, 132 *mm*. At five points on these axes of abscissas, ordinates are erected for the purpose of constructing our curve. The extreme upper and lower ones are *per se* zero, as the acuteness of hearing for the boundary tones approach the zero point. On the three middle ordinates at C, c^2, and $f^{\sharp 4}$, the squares of Hartmann's percentages are measured, which is most easily done by setting off as many *mm* as there are hundredths. Through the five points so acquired a curve is drawn which will show a comparatively regular course with but one point of maximum. At one time this maximum point will be found more to the left, at another to the right, and frequently in the middle. The figure so constructed is very similar to that of Hartmann, but differs from it in several important points. First the upper and lower parts of the scale have been added to it. Second, not the hearing times, but the squares of the latter, have been set down. In this way we approximate more closely to the physical conditions as at present understood. Third, I have abandoned the step form, because in all such constructions we conceive of a continuous change of function, and there is no objection to representing the matter as we conceive it. A graphic representation could scarcely have any other object.

The whole scale of 11 octaves forms the base lines of our figure. A youthful person having normal hearing would possess, in the Hartmann sense, 100 per cent. of acuteness of hearing. His entire acuteness of hearing, therefore, would be represented by the product of the complete scale and an ordinate height of 100 per cent. (squared) which for our figure gives an area of 132 square *cm*. This area is

the geometric expression for the field of acuteness of hearing of a child. Late in life 8 half tones are lost at the lower end of the scale, and 7 at the upper end.

To the right and left a part of the figure is wanting, and the base lines retain a length of only 117 *mm.* On this account the acuteness of an elderly person's hearing would be measured by an area of 117 square *cm.* Between both extremes lies the value for the acuteness of hearing in the various periods of life. The tables below show this for each year of life.

The figures of this table form a normal value, with which the results of measurements of hearing in pathological cases are to be compared. The normal figures are not, however, comparable with one another.

Age.	Lower Limit.	Upper Limit.	Normal Loss Below.	Normal Loss Above.	Normal Auditory Field in Square *cm.*
4	$e-^{3}$	f^{7}	—	—	—
5	"	$f^{7}-\frac{1}{4}$ tone	—	—	—
6	"	" "	—	—	—
7	"	e^{7}	—	—	—
8	"	"	—	—	—
9	"	"	—	—	—
10	"	$e^{7}-\frac{1}{4}$ tone	—	$\frac{1}{4}$ tone	$131\frac{1}{2}$
11	"	" "	—	" "	"
12	"	" "	—	" "	"
13	"	" "	—	" "	"
14	"	" "	—	" "	"
15	"	" "	—	" "	"
16	"	" "	—	" "	"
17	"	" "	—	" "	"
18	"	" "	—	" "	"
19	"	" "	—	" "	"
20	"	" "	—	" "	"
21	"	" "	—	" "	"
22	"	" "	—	" "	"
23	"	" "	—	" "	"
24	"	" "	—	" "	"
25	"	" "	—	" "	"
26	"	" "	—	" "	"
27	"	$d\sharp^{7}$	—	" "	131
28	"	"	—	$\frac{1}{2}$ "	"
29	"	"	—	" "	"
30	$e-^{3}+\frac{1}{4}$ tone	"	$\frac{1}{4}$ tone	" "	$130\frac{1}{2}$
31	" "	"	" "	" "	"
32	" "	"	" "	" "	"
33	" "	"	" "	" "	"
34	" "	"	" "	" "	"

Age.	Lower Limit.	Upper Limit.	Normal Loss Below.	Normal Loss Above.	Normal Auditory Field in Square *cm.*
35	e $-^{3}+\frac{1}{4}$ tone	$d\sharp^{7}$	$\frac{1}{4}$ tone	$\frac{1}{2}$ tone	$130\frac{1}{2}$
36	" "	"	" "	" "	"
37	" "	"	" "	" "	"
38	" "	$d\sharp^{7}-\frac{1}{4}$ tone	" "	$\frac{3}{4}$ "	130
39	" "	" "	" "	" "	"
40	$f-^{3}$	d^{7}	$\frac{1}{2}$ "	1 "	129
41	"	"	" "	" "	"
42	"	$d^{7}-\frac{1}{4}$ tone	" "	$1\frac{1}{4}$ tones	$128\frac{1}{2}$
43	"	" "	" "	" "	"
44	"	$c\sharp^{7}$	" "	$1\frac{1}{2}$ "	128
45	"	"	" "	" "	"
46	$F^{3}+\frac{1}{4}$ tone	$c\sharp^{7}-\frac{1}{4}$ tone	$\frac{3}{4}$ "	$1\frac{3}{4}$ "	127
47	" "	" "	" "	" "	"
48	" "	" "	" "	" "	"
49	" "	c^{7}	" "	2 "	$126\frac{1}{2}$
50	" "	"	" "	" "	"
51	$F\sharp-^{3}$	"	1 "	" "	126
52	"	"	" "	" "	"
53	"	$c^{7}-\frac{1}{4}$ tone	" "	$2\frac{1}{4}$ "	$125\frac{1}{2}$
54	"	" "	" "	" "	"
55	$F\sharp-^{3}+\frac{1}{4}$ tone	b^{6}	$1\frac{1}{4}$ tones	$2\frac{1}{2}$ "	$124\frac{1}{2}$
56	" "	$a\sharp^{6}$	" "	3 "	$123\frac{1}{2}$
57	" "	$a\sharp^{6}-\frac{1}{4}$ tone	" "	$3\frac{1}{4}$ "	123
58	" "	" "	" "	" "	"
59	$G-^{3}$	a^{6}	$1\frac{1}{2}$ "	$3\frac{1}{2}$ "	122
60	"	"	" "	" "	"
61	"	$a^{6}-\frac{1}{4}$ tone	" "	$3\frac{3}{4}$ "	$121\frac{1}{2}$
62	$G-^{3}+\frac{1}{4}$ tone	" "	$1\frac{3}{4}$ "	" "	121
63	" "	" "	" "	" "	"
64	" "	$g\sharp^{6}$	" "	4 "	$120\frac{1}{2}$
65	$G\sharp-^{3}$	"	2 "	" "	120
66	"	"	" "	" "	"
67	$G\sharp-^{3}+\frac{1}{4}$ tone	"	$2\frac{1}{4}$ "	" "	$119\frac{1}{2}$
68	" "	"	" "	" "	"
69	$A-^{3}$	"	$2\frac{1}{2}$ "	" "	119
70	"	"	" "	" "	"
71	$A-^{3}+\frac{1}{4}$ tone	"	$2\frac{3}{4}$ "	" "	$118\frac{1}{2}$
72	" "	"	" "	" "	"
73	$A\sharp-^{3}$	"	3 "	" "	118
74	"	"	" "	" "	"
75	$A\sharp-^{3}+\frac{1}{4}$ tone	"	$3\frac{1}{4}$ "	" "	$117\frac{1}{2}$
76	" "	"	" "	" "	"
77	$B-^{3}$	"	$3\frac{1}{2}$ "	" "	117
78	"	"	" "	" "	"
79	$B-^{3}+\frac{1}{4}$ tone	"	$3\frac{3}{4}$ "	" "	$116\frac{1}{2}$
80	$C-^{2}$	"	4 "	" "	116

To calculate the acuteness of hearing for tones by aid of the table two methods are available.

1. To estimate the area enclosed between the curve and

the axis of abscissas. This may be accomplished by counting the small millimetre squares, a somewhat tedious procedure, or by the aid of a planimeter, or finally by weighing the piece of paper cut out along the curve and the axis of abscissas.

2. We may divide the area thus estimated by the area of the normal auditory field for a corresponding age.

If desired the latter of these procedures may be omitted and the form of a common fraction be retained. In this the value of the pathological auditory field forms the numerator, that of the normal field the denominator. An example may be cited. A woman sixty-six years of age suffering from sclerosis. Acuteness of hearing for whispered speech 30 *cm*, that is $\frac{1}{60}$ ($\frac{\cdot 30 \text{ metre}}{18 \text{ metre}} = \frac{1}{60}$). For the same ear we constructed the accompanying auditory field. To save space the upper

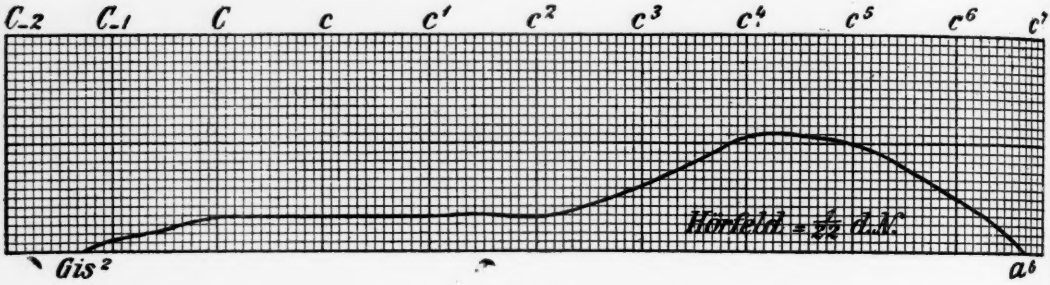

FIG. 1.

part of the field has been omitted. Its area is 5.45 *cm*. At the same age the normal field would contain 120 *cm*. We estimate the general hearing for tone therefore at $\frac{5.45 \text{ cm}}{120 \text{ cm}} = \frac{1}{22}$. It is apparent that there exists a marked difference between hearing for speech and that for tones. The latter is three times greater. The question is, Can this remarkable difference be due to errors in the method? The amount of difference found here makes it improbable that the slight uncertainties of our technique should be made accountable for it. In whatever way we attempt to make the correction, the difference always increases, never diminishes, and it is clear that in this case of sclerosis, and it is so in many, tone-hearing exceeds hearing for speech widely.

The cause of this symptom might be discussed here, but I shall reserve it for a later article.

In the future we shall be forced to designate the quantitative relation of the two with increasing accuracy and precision. We shall earliest acquire exactness for the hearing of tones, and I believe our science has this task to finish among the first. In addition a measurement of hearing will be reached which will suffice for all theoretic requirements and teach us a determination of acuteness of hearing which I may call absolute.

SUMMARY.

1. If Gradenigo's auditory field is completed and constructed according to physical laws, it furnishes an absolute measure for the acuteness of hearing. It is only necessary to compare its area with the normal area at a like age in order to obtain a quantitative expression of the sensory acuteness in general.

2. For the construction of the auditory field five observations will provisionally suffice: Lower boundary tone, C, c^2, $f^{\#4}$, and upper boundary tone. Only in case tone gaps are present will it be necessary to undertake measurements of a greater number of steps. By a previous orientation we shall have found the most appropriate points on the scale for each individual case.

3. For certain scientific examinations a more exact estimate of the auditory field will be required. In this case the number of steps measured must be as great as possible. If it were practicable to establish a quantitative estimate for each tone of the chromatic scale, the size of the auditory field would give the absolute acuteness of hearing. Our clinical estimates should approach this limit as closely as possible.

HISTORY OF A BRAIN TUMOR.

By Prof. S. MOOS, of Heidelberg.

Translated by Dr. A. B. Kibbe, Seattle, Washington.

(*With Plates I. and II. of Vol. XXV. of German Edition.*)

March 21, 1888, I was consulted by a patient twenty-one years of age, by occupation a merchant.

His present trouble appeared during the first week in January, 1888, at which time he had been working in a cold store. Early in February his gait became unsteady, and for the past five weeks he has been very hard of hearing. He has also been under the treatment of Dr. Weiss for diplopia on the left side.

Status Præsens. There exists paralysis of the left facial. He can still whistle, but can neither wrinkle the left brow nor blow his nose. The naso-labial fold has disappeared. No epiphora. Total deafness for speech in the left ear. Tuning-fork test by bone-conduction, positive in the right, negative in the left. Forks of 128 and 256 vibrations, but not higher, are still heard by air-conduction at a distance of a few centimetres. A loud ticking watch is heard when pressed against the left ear; also by bone-conduction. The acumeter is similarly heard. No tinnitus. Examination of the left middle ear gave normal findings. Right ear intact throughout.

Regarding the examination of the eyes, the following report was received from Dr. Weiss:

"Not quite normal acuteness of vision in both, with myopia $\frac{1}{7}$. Diplopia resulting from paralysis of the left

abducens. Ophthalmoscopic examination reveals no gross changes." The report of April 6th reads: "With high myopia a slightly reduced acuteness of vision. Ophthalmoscopic findings not normal; slight veiling; otherwise as before."[1]

From these symptoms the probability that their cause was to be looked for in a brain tumor became justified, and I therefore stated to the father, soon after my first examination, that his son was not affected with an ordinary form of deafness, but rather with a severe brain affection, and advised, therefore, a consultation with Prof. Erb, which took place March 21st, and gave the following results:

Paresis of left abducens. Pronounced nystagmus in all directions. Paresis of left facial. Uvula not exactly straight. .Slight dulling of sensibility of the left half of face. Hearing as above. Tongue straight. Frequent difficulty in swallowing of late.

Sleep, memory, and speech good.

Staggering gait. Cerebellar ataxia, particularly in the left leg.

Dynamometer: Right, 65°; left, 51°.

Sensibility of left extremities good. Left hand and fingers slightly stiff. No contractures. Tendon reflexes in the left arm increased. Standing with closed eyes good. Standing on toes possible. Pupils normal. Visual acuity, etc., as above. In consideration of the cerebellar ataxia, the paresis of the left facial and abducens, the participation of the left trigeminus and the acoustic, and the slight weakness and increase of tendon reflexes on the left side, the diagnosis was made of an affection of the cerebellum and medulla, probably a tumor (glioma).

Course of disease to the date of death:

April 13th: Total extinction of hearing power for all sources of sound.

Increase in facial paralysis. Angle of mouth strongly drawn to the right. Incomplete closing of left eye during sleep. Some ability to whistle still present.

[1] I requested an ophthalmoscopic examination later, but was refused it by the father. Whether choked disc was present later is on this account uncertain.

Diameter of pupils variable, the left being occasionally the larger.

Speech good.

No fever at any time. Within two days of death pulse between 60 and 70, strong; after this 56.

Vomited one or more times each day.

Staggering gait as before. No ptosis, no alternating paralysis.

Consciousness retained up to the last day.

Death shortly before midnight April 26th.

Autopsy.—On removal of the skull-cap, to which it was loosely attached, the dura mater appeared moderately tense on both sides and in contact with the convexity throughout. Fluid blood in the posterior portion of the longitudinal sinus. No thrombi. Veins of the dura filled with blood. In the subdural space, a slight increase in amount of clear serum. Pial veins tense. The pia itself on the convexity was clear and transparent; at the base, however, particularly over the fossa Tarini and the left fissure of Sylvius, it was milky-white and thickened.

The gyri of the cerebral convexity slightly broad and flat, otherwise the cerebrum viewed externally as well as from an incision made forwards from about 1 *cm* in front of the optic chiasm was without noticeable change; its substance moderately vascular and greatly infiltrated with serum. Lateral ventricle not essentially dilated. The upper surface of the cerebellum appeared equally unchanged; on the under surface, however, a tumor is present, of a grayish-white color, without externally visible hemorrhages, soft, and markedly œdematous.

It includes the location of the left crus of the pons, the outer part of the left half of the pons, and the adjoining section of the crura of the cerebrum, which structures with a moderate increase in area, have been completely transformed into tumor mass. A strip about 1 *cm* broad lying alongside the median line of the left half of the pons, has apparently remained intact. From here the tumor extends towards the cerebellum and the medulla oblongata, and penetrates to the interior of the left hemisphere of the cerebellum without, however, altering its form or boundary; in

the cord the left pyramid, slightly more atrophic perhaps than on the other side, with the roots of the hypoglossal, is intact. The lateral portions are replaced by the tumor in such a manner that the medulla oblongata at about the level of the centre of the olivary body is $2\frac{1}{2}$ *cm* broad.[1]

Correspondingly the left half of the fourth ventricle is marked only by a narrow and shallow depression. Inferiorly the tumor appears to extend about $1\frac{1}{2}$ *cm* from the lower angle of the rhomboid fossa.[2]

The sinuses of the base of the skull contain but little fluid blood. The brain was not dissected further but was hardened in toto.

Summary of cranial nerves at base of brain on its removal:

Right.	*Left.*
Olfactory, optic, oculo-motor, and trochlear are wanting. The other eight are present.	Olfactory, optic, oculo-motor, trochlear, trigeminus, and abducens are wanting; auditory and facial have disappeared in the tumor mass. The other nerves are present.

HISTOLOGICAL CHARACTER OF THE TUMOR.

The homogeneous, finely fibrillated groundwork is permeated partly with scanty, partly with moderately filled delicate-walled blood-vessels, only a few showing a thickening of their walls. The bulk of the tumor consists of small round and spindle cells; the former lying in heaps around the vessels. Branches of the latter are often in close association with the vessel walls, whereby a thickening of the latter is evident (see above). In a few completely non-vascular localities smaller and larger collections of exuberant glia cells are seen. Normal nerve fibres are sometimes discovered singly, at others in fairly wide bundles. The latter

[1] In contrast with $1\frac{1}{2}$ *cm* on the right side.

[2] It so appeared macroscopically. The microscopic examination, however, gave a different result (see farther on).

appear particularly plain in nigrosin [1] preparations and those treated by Pal's method.[2]

Dark-contoured ganglion cells with faintly colored nucleus without a trace of processes are seen singly which at first sight simulate large sarcoma cells. Nucleus and protoplasm of the ganglion cells are frequently markedly granular, with commencing fatty degeneration. The tumor is therefore a primary, mainly small-celled, round, and spindle-celled sarcoma, having in places the character of a glio-sarcoma.[3]

Regarding its origin two things are possible. Either development took place from the glia cells, or the tumor arose from the blood-vessels, or both. The first hypothesis is supported by the finding of glia cells although these were few. The second by the heaping up and grouping of the previously mentioned cell elements in the immediate neighborhood of the blood-vessels (Fig. 3).

From what spot the tumor sprang is difficult to say; in all probability from the external portion of the left half of the pons; for toward the centre it was free for the distance of 1 *cm* (see above).

The development of the tumor from the pons is probable from the early appearance of staggering gait, even though it has been established that this symptom is only an exceptional consequence of tumors in this locality (see later). The great expansion of the tumor by including the left crus of the pons and of the cerebrum, its extension toward the cerebrum and in the direction of the medulla oblongata, caused a pressure on the neighboring parts and through this their displacement.

A view of Figs. 1 and 2 shows the raphe on the *right* side. The left side showed with the naked eye a narrowing of about one half (microscopic examination revealed simple atrophy from pressure). Between the inner right and left

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[1] See Friedlaender's *Mikrosk. Technik*, 4te Auflage, Berlin, 1889, S. 98.

[2] *Ditto.* Weigert's *Hæmætoxylin method modified by Pal*, S. 97.

[3] Birch-Hirschfeld, *Pathologische Anatomie*, II. Auflage, Leipzig, 1887, gives the following statistics regarding 30 cases of tumor of the pons: 17 tubercular, 3 syphilomata, 5 gliomata, and 5 sarcomata. The glio-sarcoma is distinguished from the glioma by the greater richness in cells and the not uncommon manifestation of a tendency to the formation of metastases. It develops from the cells of the neuroglia in the same way as does pure glioma.

parts a deep furrow exists which contained tumor masses which in the autopsy were described macroscopically as prolongations of the tumor. In fact, the tumor masses found here stood in no organic relation with the medulla oblongata. They had exerted, however, a pressure indicated by the arrow (Fig. 2) in the direction of a concave curve from the left below to the right above. In consequence of which, in addition to the crowding of the raphe to the right as already described, there was a complete displacement of the fibres in the same direction, exemplified by a bending of the fibræ arciformes externæ from their course toward the pyramid in such a manner that they ran almost horizontally outwards to the right.

The right restiform body was destroyed by pressure (see Fig. 1. the lateral part between *g* and *o*).

In sections of the upper half on the right side, nerve fibres in nearly normal abundance were present, while those of the under half seemed to be scanty. In addition to the olive, two nuclei with well preserved ganglia are seen on the floor of the fossa rhomboidalis (see explanation of cuts) of the right side. At the left nothing of this kind is apparent, a degeneration of the ganglion cells as well as of the nerve fibres having taken place.

Particularly noteworthy is the *entire disappearance of the nuclei and root fibres of the abducens, facial, and auditory of the left side.*

RESULTS OF THE EXAMINATION OF THE LEFT TEMPORAL BONE.

THE MIDDLE EAR.

The articulations of the ossicles as well as the mucous membrane of the labyrinth wall are normal.

The centre of the tensor tympani muscle consists of fat; the remainder has undergone waxy degeneration. Nowhere is even a single normal muscle fibre to be found. Between the periosteum of the stapedius and its septa are numerous blood extravasations; structure of the muscle normal in the main; a few fibres waxy or changed to connective tissue. Vestibular connection of stapes normal.

THE LABYRINTH.

The pyramid of the petrous bone is marked by numerous non-ossified areas of cartilage (chondroblasts); in addition by several spots of cicatrized necrosis, such as I have described and figured in these ARCHIVES, vol. xxii., p. 64.[1] The bone corpuscles in the pyramid are also frequently altered; sometimes having a homogeneous glistening fatty appearance, at others being regular in form but with stunted or entire absence of processes, without nucleus, or granular (see Fig. 4).

In many places the medulla of the pyramid has undergone a colloid change.

THE AQUÆDUCTUS COCHLEÆ.

In its interior a small extravasation of blood. Evidences of stasis in the veins: densely packed with deformed blood corpuscles.

AQUÆDUCTUS VESTIBULI.

At the inner fourth the bony canal becomes suddenly irregularly dilated with hyperplastic periosteum, on the borders of which toward the interior are two round particles of bone encapsuled by thick bands of connective tissue,—probably a cicatrized necrosis of the bony wall with encapsulated sequestra. The inner part (vestibular half) of the canal contained great numbers of connective-tissue cords extending from the periosteum and crossing its interior from one side to the other.[2]

They have no epithelium as do those springing from the papillæ and, aside from their marked thickness, might on this account be considered pathological. Between the meshes of the connective-tissue bands tensely filled blood-vessels are seen with here and there smaller and larger blood extravasations. Nucleus and protoplasm of the epithelium of the papillæ often show commencing fatty degeneration; the granular contents of the nucleus and part of the protoplasm staining black with osmium.

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[1] Many still showed healing to have taken place by aid of osteoblasts.

CONDITION OF THE FACIAL AND AUDITORY NERVES.

The facial, shortly before its separation from the auditory, shows a destruction of its superficial layers by hemorrhage, which extends slightly beyond the point where it crosses the ligamentum spirale. The central portions which still remain intact in this section show imperfect osmium staining, having a greenish or smoky topaz-like appearance, and only becoming black 3 *mm* before the last bend. Fresh hemorrhages exist in a few places.

The hemorrhagic destruction of the auditory is more marked than that of the facial. Here and there in its course large fresh hemorrhages are seen in place of the destroyed nerve. The nerve cells of the individual turns of the ganglion spirale were still intact, while the greater part of the same as well as those of the trunk of the acoustic and the ganglion geniculi were altered. In many places the nuclei of Schwann's substance had disappeared while the wall of the ganglion cell was still retained.

THE CELL FORMATIONS.

This in individual regions of the entire cochlea, particularly of the ductus cochlearis, showed a commencing fatty degeneration similar to the ganglion cells; likewise the cells of the sulcus spiralis internus and externus, of Corti's arches, of the ligamentum spirale, and those of Reissner's membrane.[1]

REISSNER'S MEMBRANE.

Was depressed toward the ductus cochlearis.

THE MEMBRANE OF THE ROUND WINDOW

was convex outwardly, and unchanged in structure; especially noteworthy is it that there were no pseudo-ligaments on its exterior, which as we know are often present and cause a convexity of the membrane outward.

[1] The commencing fatty degeneration of the ganglion cells and of the cell elements in the labyrinth are to be looked upon as a consequence of circulatory disturbance.

THE AMPULLÆ.

The following is worthy of note. The nerve and lining epithelium were changed in a similar manner to the cellular elements of the ductus cochlearis; likewise the cells of the sacculus endolymphaticus around the cupula terminalis. The blood-vessels of the cristæ were densely filled and almost perfect in appearance as though naturally injected.

UTRICLE AND SACCULE.

Their cellular elements were similar to those of the cristæ. The blood-vessels between the ligaments tense. Interior of both saccules normal.

THE SEMICIRCULAR CANALS.

On the outer wall of the posterior semicircular canal, the vessels of which show globular stasis, were one small and one large blood extravasation; with this exception it was normal. The endolymphatic space of the median crus of the exterior canal was filled for a short distance with connective and osteoid tissue. The perilymphatic space was normal.

The most important changes were shown by the

ANTERIOR SEMICIRCULAR CANAL,

one portion of which showed the endolymphatic space filled with connective and osteoid tissue, and the perilymphatic with thick bands of connective tissue and large thick-walled tense blood-vessels, between which were numerous small blood extravasations. In the other portion the ends and perilymphatic spaces formed a common cavity filled with hyperplastic periosteum, osseous and connective tissue, amorphous masses, and numerous fatty granules lying singly and in groups, between which were rifts and fissures, caused by destruction of tissue, without a trace of blood-vessels (see Fig. 4).

ANALYSIS OF THE SYMPTOMS PRESENT.

According to the patient's statements, staggering gait was the first symptom manifested, later left-sided deafness. It is possible that the latter was the first to arise and was only noticed when it reached the high degree already described. At all events the staggering gait was a very early symptom. This point seems to me to be very important in reference to the origin of the tumor.

In his *Topischen Diagnostik der Gehirnkrankheiten* Nothnagel says in the chapter on diseases of the pons: "Ataxia does occur in tumors of the pons, more often really through pressure, though in a few cases this symptom was present in pure pons affections."

M. Bernhardt says:[1] "In 19 cases there was staggering gait twice (the tumor included the entire pons and exerted pressure outwardly), once inability to walk." In our case, as the autopsy showed, without doubt a strong pressure on the cerebellum existed, though late in the disease. At this time in the disease the staggering gait may be assumed to be an indirect focal symptom, but whether also for the first period of the tumor's development remains very doubtful.

Diplopia also appeared on the left side very early. This annoyed the patient more than the disturbance in hearing. On this account he sought assistance earlier. The affection was homonymous and is not uncommon in diseases of the pons (Nothnagel *l. c.*). Bernhardt (*l. c.*) found homonymous diplopia 20 times in 29 cases of pons tumor. This symptom is sufficiently explained in our case by the complete destruction of the abducens and root fibres.

The paresis of the entire facial appeared very early and on the same side with the previously mentioned disturbance. It is explained by the destruction of both nuclei of the facial and its root fibres. As is well known it is very characteristic of pons tumors when combined with paralysis of contralateral extremities, which was absent in this case.

Implication of the entire facial, noted as a peculiarity by Nothnagel, was present, which he states always appears

[1] *Beiträge zur Symptomatologie der Gehirngeschwülste*, Berlin, 1881.

when, as in our case, the common nucleus of the facial and abducens is attacked. The increase in the facial paralysis from the 14th of April on, may be referred to the hemorrhage in the course of the nerve through the petrous bone. Nystagmus according to the same author is rare in pons tumors. In our patient it was present in a pronounced degree, likewise anæsthesia of the trigeminus (to a slight extent). Nothnagel also states that the trigeminus is relatively often affected in pons tumors. The autopsy afforded no manifest explanation of these symptoms.

THE DISTURBANCES OF HEARING.

According to Nothnagel these are among the greatest rarities in pons tumors. This is certainly noticeable when we consider the anatomical relations. Bernhardt says: "Disturbances of hearing are relatively as rare as those of vision. Both occurred 8 times in 27 cases. Usually the hearing on the same side as the tumor was impaired by tinnitus, seldom entirely lost. In this connection the fact must not be lost sight of, that, in a few cases, alongside of the tumor in the pons itself pathological changes were discovered near the base. In one instance the auditory has been described as having been destroyed by the pressure of basal changes."

In connection with our observations the case of Wernicke[1] is particularly noteworthy. The patient manifested on the side corresponding to the tumor "probably slightly weaker hearing," and yet the autopsy showed "a large portion of the inner and outer auditory nucleus" destroyed (nomenclature according to Meynert). Unfortunately the report of the autopsy contained no reference to their root fibres.

Regarding the functional disturbances of hearing the following factors are to be considered with reference to the changes found in the central organs and petrous bone.

1. The fact that the ventral as well as the dorsal nucleus of the acoustic and its root fibres had completely disappeared in the tumor mass, as shown by careful examination.

2. The hemorrhage in the main trunk of the acoustic in

[1] *Archiv f. Psych. u. Nvkh.*, Bd. vii., S. 513.

the porus opticus internus and the consequent obstruction of its fibres progressively increasing peripherally as far as the separation of the fibres to the ganglion spirale in the individual turns,—changes which alone are sufficient to explain the almost if not quite complete deafness. The cochlear hemorrhage probably occurred in the later period of increased intracranial pressure, this being a passive occurrence, and is explained by the experiments of H. Grasley,[1] which show that, by increasing intracranial pressure, the most peripherally placed of the veins have their openings into the sinuses compressed, and in consequence the pressure in the intravascular system is raised. This increase was still further added to by the described changes in the aquæductus vestibuli, and in the medial and frontal semicircular canal, which, without doubt, must have had as a consequence a hindered flow of lymph from the labyrinth.

3. Lastly, I may not omit the above described change in the position of Reissner's membrane and the membrane of the round window.

At the Second International Otological Congress at Basel in 1884, I treated this subject exhaustively in my paper "On the Genesis of Auditory Disturbances in Brain Tumors; The Diagnostic Value of Tuning-Fork Experiments," from which I arrived at the following conclusions:

The extension of increased cranial pressure, arising from a brain tumor, to the labyrinth is anatomatically and physiologically possible. The equalization of pressure is probably and anatomatically proved by the flow of cerebro-spinal fluid toward the vertebral canal, and that of the lymph through the foramen cæcum, and the jugular and occipital foramina (Merkel).

The consequences of increased pressure are, however, much less frequent than in the optic, as choked disc from brain tumors occurs much more often than disturbances of hearing.

According to the findings of experimental physiology,[2]

[1] "Experimentelle Beiträge zur Lehre von der Blutcirculation in der Schädelrückgratshöhle." *Festschrift*, München, 1892.

[2] Ch. Burnett: "Untersuchungen über den Mechanismus der Gehörknöchelchen und des runden Fensters." *Arch. f. Aug. u. Ohrenheilk.*, ii., 1872.

which show that in raised intracranial pressure the round window suspends its function earlier in the conduction of high tones than in that of low ones, the perception of high musical tones is soonest destroyed in cases of brain tumor with raised labyrinthine pressure.

In the position of Reissner's membrane and the membrane of the round window in our case, we believe we have furnished proof of increased pressure in the perilymphatic space. In addition, it is worthy of note that the hearing power *for tones from the upper to the lower tone limits was lost.* Unfortunately the case was so complicated that the presumption of absent perception of the high tones consequent on increase in labyrinthine pressure could not be converted into a certainty. If we desire to assume, which certainly is justifiable, that the cochlear hemorrhage may be viewed as the latest change, there still remains as an essential factor the disappearance of the nuclei of the acoustic and their root fibres, which must also be taken into consideration.

Regarding the tests of function there still remains as noteworthy, *the relatively long retention of bone-conduction*, which Politzer first pointed out as characteristic of brain tumors.[3]

REMARKS ON THE CHANGES IN THE PETROUS BONE NOT CONNECTED WITH DISTURBANCES CAUSED BY THE BRAIN TUMOR.

The patient stated that between his sixth and eighth year he had measles and scarlatina. With one of these infectious diseases, or possibly with both, may be connected:

1. The waxy degeneration of the tensor tympani. As the patient played the piano and had never been aware of any disturbance in hearing previous to his present illness, it is probable that the function of the right ear was entirely normal.

2. The previously described disease findings in the bony tissue of the pyramid of the petrous bone, as well as the peculiar changes of the bone corpuscles, the colloid change of the medulla, and necrosed spots (which had healed) in the

[3] *Lehrbuch der Ohrenheilkunde*, II. Auflage, 1887, S. 415.

pyramid and in the aquæductus vestibuli may have been caused by the immigration of bacteria into the bone corpuscles or medullary spaces by way of the aquæductus vestibuli from the blood-vessels of the periosteum.

3. The findings in the frontal (in part those also in the median) semicircular canal I take to be the result of the mechanical influence of those micro-organisms which wandered there at the time the infectious diseases existed, therefore as products from lymph-cell conglomerations.

Explanation of Figures.

FIG. 1. Cross-section through the medulla oblongata a little below the middle of the olivary body, posterior to the tumor. Carmine ; ¼ natural size.

n. xii. Nucleus of the hypoglossus
n. x " " vagus
n. g. " " Funiculus gracilis
n. c. " " " cuneatus
g Substantia gelatinosa
O Olive
O a n Internal accessory olive

} Normal.

R Raphe. Within it a large blood-vessel.

P Pyramid. The lowest border of which (lateral part in the drawing) has been omitted.

FIG. 2. Section as in Fig. 1. Pal's method of staining ; ⅔ the natural size.

B iv Floor of the 4th ventricle.
f a Fibræ arciformes externæ.
R Raphe. In both drawings it appears on the right side.
→ Course of pressure exerted by tumor, in the area of which the vicinity of the pyramid was destroyed by the preparations for removal of brain.

See foot-note to report of autopsy.

N. B.—In figures 1 and 2 only the right side have been marked with letters.

FIG. 3. A section of tumor in the vicinity of the left crus of the pons close to the latter. Eosin-hæmatoxylin stain. Numerous round and spindle-shaped cells are seen, the latter slightly less in number. The former particularly numerous in the vicinity of the blood-vessels. Basement substance and specific elements

alike faintly stained. No evidence of nerve fibres or their elements. Here and there are seen a few dark canton-red degenerated ganglion cells (*g z*) with faintly stained nucleus without process.[1]

FIG. 4. Sagittal section through the posterior semicircular canal. Hæmatoxylin. Acid fuchsin, picrocarmin. *K* bone, *P* periosteum, the latter greatly thickened, the former poor in bone corpuscles, which have stunted processes, and are markedly granular. Endo- and peri-lymphatic spaces form a common space, which is filled with bridges of connective tissue more or less thick, ostoid tissue, the latter particularly plain in the centre, amorphous masses, numerous fat granules stained black with osmic acid, and lying singly or in heaps. In the field are many rifts and fissures caused by destruction of connective tissue. No blood-vessels to be seen.

[1] The lower figure on plate II, erroneously designated as Fig. 3.

REPORT ON THE PROGRESS OF OTOLOGY DURING THE SECOND HALF OF THE YEAR 1893.

I.—NORMAL AND PATHOLOGICAL ANATOMY, HISTOLOGY, AND PHYSIOLOGY OF THE HEARING ORGAN AND THE NASO-PHARYNGEAL CAVITY.

By Prof. AD. BARTH, Marburg.

Translated by Dr. Max Toeplitz, New York.

A.—ANATOMY.

a.—HEARING ORGAN.

1. Randall. Preliminary communications on measurements of the skull with reference to the anatomy of the ear. *Trans. Amer. Otol. Society*, vol. v., part 2, 1892.

2. Bertelli. The structure of the membrana tympani (presented by Romiti). *Trans. of Anat. Soc. at Goettingen*, 1893. From the *Anat. Anzeiger*, 1893, p. 204.

3. Howe, M. L. The comparative anatomy of the ossicles. *Amer. Otol. Soc.* Review in *Rev. de Laryng.*, etc., 1893, p. 784.

4. Habermann, J. Cholesteatoma of the middle ear. Reprint from the *Mittheil. d. Vereins der Aerzte*, in Styria, 1893, Nos. 8 and 9.

5. Manasse. Pathologico-anatomical communications from the policlinic of the university at Strassburg. *Virchow's Archiv*, vol. cxxxiii., p. 387.

6. Steinbruegge. The ductus cochlearis of man in the vestibular blind sac. *Anat. Hefte*, part i., No. viii., 1893.

7. Lenhossek, M. von. The nerve terminations in the hear-

ing organ. *Trans. of the Anat. Soc. at Goettingen*, 1893. *Anatom. Anzeiger*, 1893.

8. HELD. The central conduction of hearing. *Arch. f. Anat. u. Entwicklungsgeschichte; Anat. Abth. des Arch. f. Anat. u. Physiol.*, 1893, Nos. 3. and 4.

9. PENZO, R. The ganglion geniculi and its associated nerves. (From the Anat. Inst. of the university at Padua.) *Anat. Anz*, 1893, p. 738.

10. MARTIN, PAUL. Contribution to the termination of the acoustic nerve in the brain of cats. *Anat. Anz.*, 1893, p. 181.

11. SALA. The origin of the acoustic nerve. *Arch. f. mikrosc. Anat.*, 1893, vol. xlii.

12. HELD, D. H. Contributions to the finer anatomy of the cerebellum and the cerebral trunk. *Arch. f. Anat.*, Phys.-Anat. part, 1893 Nos. 5 and 6.

1. The examinations of 122 skulls are not in accordance with Koerner's views of a definite relation between the form of the skull and the location of the lateral sinus and the middle cerebral fossa. They confirm only the fact that the right lateral sinus is situated more anteriorly and outward than the left.

2. BERTELLI presents through Romiti the results of examinations of the comparative anatomy of the membrana tympani, which will be more fully published. 1. In the membrana tympani of mammals, apart from the fixed cells of the connective tissue, as described by Troeltsch, other fixed cells are found which are situated upon the outside of the membrana tympani. These cells exhibit many processes anastomosing with one another. 2. Among the gnawers an abundance of cartilaginous cells exist in the annulus tympanicus, in isolated numbers, also in that of man. 3. The foramen Rivini is not a normal formation.

3. Gruber's view of the transformation of the long process of the malleus into connective tissue, which is thus to be considered as a ligament, is confirmed by comparative anatomy. The representation of the malleo-incudal articulation of Helmholtz holds good also in the orang and some higher animals. The form of the malleus and incus changes frequently, even in individuals of closely allied families. The form of the stapes always resembles a stirrup.

4. The lecture does not furnish any new ideas, but a good synopsis on the present state of the knowledge of cholesteatoma

with preference given, of course, to the personal views of the lecturer. The paper is illustrated by personal observations and demonstrations of specimens

5. In aural polypi from the tympanic cavity of a boy, aged thirteen, there were found lymphomata, cysts, and giant cells. The lymphomata are explained from accumulation of leucocytes, the cysts by their central disintegration, the giant cells by the more intense growth.

6. The vestibular blind sac forms, with all its structure, a well-nigh hemispherical curvature from without toward the inner side. For the better understanding of the relations compare the original, which is illustrated by seven figures.

7. The examinations of the maculæ and cristæ acusticæ of the mouse made with Golgi's method confirm Retzius' views of the exclusive occurrence of free nerve terminations in the sensory epithelia of the hearing organ. The histogenetic and also the trophic centre for the acoustic fibres are situated in the ganglia of the acoustic nerve. The fibres grow from their bipolar nerve cells in two directions, viz.: into the medulla oblongata, and between the epithelium of the nerve terminations, in order to dissolve at either place into free terminating twigs. The nerve penetrates a cell. Strongly stained specimens allow well to distinguish three areas: a layer of hard cells, a stratum plexiforme, and a layer of supporting cells.

8. The central acoustic conduction is formed by the entrance of the cochlear nerve into the brain; its axis-cylinders, according to the investigations of His, Retzius, and v. Lenhossek, originate in the bipolar cells of the *cochlear* ganglion as their central processes. The cochlear nerve thus acts like a sensory spinal nerve, which enters the gray matter of the spinal cord and dissolves into branches. The first gray masses of the brain, in which the acoustic nerve terminates with its branches, are the ***anterior acoustic nucleus*** and the ***tuberculum acusticum (primary area of termination of the cochlear nerve)***. A number of axis-cylinders of the cochlear nerve form relations beyond this primary zone with other gray masses of the trunk of the brain—*e. g.*, with the upper olivary complex of the same side, probably also with its decussated portion, and perhaps with the lateral nucleus of the lemniscus and the ganglion of the lower corpus quadrigeminum. These ***intramedullary direct branches*** of the ***axis-cylinders*** of the ***acoustic nerve*** form the ***foundation*** of the ***central acoustic conduction;*** they

may be designated as *systems of nuclear fibres.* In the different gray masses of the central acoustic conduction *(anterior acoustic nucleus, tuberculum acusticum, upper olive, and trapezoid nucleus, lateral nucleus of lemniscus, ganglion of the lower corpus quadrigeminum, middle gray matter of the upper corpus quadrigeminum)* ganglionic cells are situated, which are distinguished by a certain size of the cellular body, abundance of protoplasmatic branches, and a long and strong process of the axis-cylinder. They are the *system cells* of the acoustic nerve, because its axis-cylinders anastomose with their protoplasmatic processes. The acoustic impressions are conducted through these system cells, viz., through the branchings of their axis-cylinders. These tracts of axis-cylinders, which advance *in the same sense* as the radical fibres of the *cochlear nerve* in the brain trunk, form together the *systems of the second order.* They form the principal part of the central acoustic conduction. The system cells of those different gray masses of the central acoustic conduction are partly related to one another in such a way as to effect the terminations around higher gray masses of anastomoses of those axis-cylinders which originate farther below from system cells of the central acoustic conduction. The central acoustic conduction is thus partly composed by a number of *neurons.* On the other hand, the different gray masses, in addition, act upon one another, viz., by collaterals of the lower upon the higher system cells. Apart from these ganglionic cells, from which the systems of the second order develop, other ganglionic cells exist at different places of the central acoustic conduction, the axis-cylinders of which form *recurrent systems* of the central acoustic conduction. They arise from higher portions of the central conduction (upper corpus quadrigeminum, middle gray substance) to its deeper gray masses (upper olive, trapezoid nucleus). They take an opposite course to the systems of the second order. Their axis-cylinders thus advance toward the primary zone of termination of the acoustic nerve, so that the final tracts of fibres of the recurrent systems terminate where the first tracts of the systems of the second order originate from. The central acoustic conduction divides into a *transverse portion (trapezoid body)*, traversing the brain trunk, and into a *portion ascending* to the middle cerebrum (*lateral lemniscus*). Two lateral lemnisci arise from each side of the trapezoid body ; each containing *for the greater part decussated*, for the *smaller part non-decussated, central paths* of the cochlear nerve, thus establishing

similar relations for the *acoustic nerve* with those of the *optic nerve.* The *trapezoid body originated* in the *anterior acoustic nucleus;* the axis-cylinders of the system cells, located in this region, become trapezoid fibres. Since the acoustic nerve acts with its fibres and anastomoses of axis-cylinders upon those cells, the *trapezoid body* thus becomes *a central path* for the *cochlear nerve.* With reference to the trapezoid body, we distinguish a *ventral* and a *dorsal* formation; the latter consists of a system, surrounding dorsally the restiform body. This has been designated by former authors as "deep portion of the striæ acusticæ." These *striæ acusticæ proper* originate from the pyramid-like system cells of the *tuberculum acusticum.* Their decussation is situated behind the trapezoid body in the raphé. They join the trapezoid body at the decussated upper olive, in order to form conjointly the lateral lemniscus. *Apart from the anterior acoustic nucleus,* the *trapezoid body originates* also in the complex of both *upper olives* and trapezoid nuclei, so as to intensify here the systems of conduction, developing from the primary zone of termination. The trapezoid body ascends on each side toward the corpora quadrigemina as *lateral lemniscus;* the upper olivary complex also continues upward as "*lateral nucleus lemnisci.*" From the cells of this region, which are surrounded by collateral and terminating fibres of the trapezoid body, develop new *lemniscus fibres* which are attached partly to the *systems of the second order,* partly to *recurrent paths.* The central acoustic conduction ends for the greater part as lateral lemniscus in the *ganglion of the lower corpus quadrigeminum* (decussated and at the same side) and in the *middle gray matter of the upper* corpus quadrigeminum with reference to the systems of the radical fibres and the systems of the second order; finally, *the uppermost fibrous tracts* of the *recurrent systems* originate therefrom. For the smaller part the central acoustic conduction runs as *direct acoustic cortical path* (intensified by fibres, originated from the gray matter of the corpora quadrigemina) through the middle cerebrum to the *cerebrum* into the *temporal lobe.* The central acoustic conduction presents a number of fibrous tracts with *reflex character,* connected with gray cerebral masses which partly contain *motory cells for the origin* of different head nerves, partly represent centres which have been physiologically demonstrated in the *formatio reticularis.* The latter are acted upon by *collaterals of the striæ acusticæ* during their course through the entire thickness of the brain trunk,

and also those of the *trapezoid body* which dorsally branch off the latter. With reference to the nuclei of the cerebral nerves there exist *reflex arches* to the *facial* and *abducens;* the former form *collaterals* of the *trapezoid body* the latter *a system originating in the olivary complex ("pedicle of the upper olive").* Apart from these reflex paths which are given off in the region of the pons, there exists a powerful and extremely important path for its further relations, the origin of which is situated in the middle cerebrum and descends toward the spinal cord. Its original cells are situated as *large multi polar ganglionic cells in the middle gray substance of the anterior corpus quadrigeminum.* These are not only acted upon by the acoustic nerve, since the final irradiations of the lateral lemniscus ramify around them, but also the *optic nerve* from the roof of the middle cerebrum. It is, therefore, to be designated as the *common reflex path of the optic and acoustic nerves.* It passes for the smaller part, the *decussated nucleus of the oculomotorius;* for the greater part, it descends toward the spinal cord into the masses of the remaining antero-lateral column of the middle line, after having crossed over to the other side at the level of the nucleus of the oculomotorius, immediately below the posterior longitudinal fascicle *(fountain-like decussation of the tegmentum).* It gives off at this region collaterals to the *nucleus of the oculomotorius of the same side and its decussation.* (In man it then descends in the middle portion of the posterior longitudinal fascicle; in lower vertebrates their union takes place in the pons.) Furthermore, collaterals are given off to the *nucleus of the trochlearis* (decussated to the origin of the system) and to the *nucleus of the abducens* (decussated). It results from degenerations that this reflex path reaches the spinal cord, so as to neccessitate optical and acoustic impressions to act also upon the *first cervical*, upon the innervation of which the *turning muscles of the head* are dependent. Hence follows from the anatomical connections and relations of this cerebral *reflex path* that it is well adapted to transfer *impressions of the optical and acoustic spheres* upon the *motory apparatus of the eyes* and the *head.* AUTO-REVIEW.

9. The investigations extend over the anatomy of man, horse, donkey, swine, sheep, dog, cat, rabbit, rat, mouse, and turkey. They refer to the ganglion geniculi, the N. intermedius Wrisbergii, the NN. petrosi superficiales, the chorda tympani, the facial and acoustic nerves. We shall here review the results referring to

the acoustic. Of the two roots of the facial, the thicker anterior is principally motory, the thinner posterior one principally sensory, (PENZO does here not discuss the question, whether the acoustic is not also to be considered as the sensory portion of the facial.) There exist two anastomoses with the facial: a medial one from the intermedius to the acoustic, and a lateral from the ganglion vestibulare to the genu facialis. Whether fibres of these anastomoses remain in the acoustic, or whether the second anastomosis is to be considered only as the termination of all fibres of the former, this cannot be decided. The intermedius sends fibres also to the chorda tympani. Fibres of the sympathetic, viz. from the plexus caroticus internus pass to the ganglion vestibulare of the acoustic. Fibres probably pass also from the glossopharyngeus to the ramus auricularis vagi.

10. MARTIN gives a brief synopsis of the part "Brain," written by him in the third edition of Frank's text-book on the anatomy of domestic animals. The cochlear end region of the acoustic comprises positively the "ventral nucleus" and the "tuberculum acusticum." The vestibular end region is formed by the dorsal "acoustic nucleus," the "vestibular main nucleus," and the Deiters' nucleus. There exist, in addition, a portion of the "ventral nucleus," almost the entire mass of nerve cells, between the floor of the ventricle of the posterior cerebrum, the caudal root of the fifth, and the corpus restiforme, and finally the gray mass in the surrounding of the caudal root of the acoustic. Furthermore, the author describes the various forms of nerve cells and the course of their processes.

11. The investigations were made according to Golgi's method mostly upon bovine embryos and new-born cats. The following conclusions are arrived at: 1. The Deiters', the posterior or dorsal nucleus, and Bechterw's nucleus are not nuclei for the origin of the fibres of the acoustic. 2. The anterior or ventral nucleus is the real nucleus for the origin of the fibres of the posterior root of the acoustic (N. cochlearis), and the tuberculum acusticum is the nucleus for the origin of the greater part of the fibres forming the striæ acusticæ. 3. The anterior nucleus consists in its more central portion of elements with the character of central nerve centres, and in its more peripheric portion of encapsulated elements calling to mind peripheric nerve cells. The nerve process of the former resembles the elements of the second type and forms a network from which the fibres of the inner and

anterior portion of the posterior root of the acoustic develop. The others send forth their nerve process which is implanted at right angles into the fibres of the anterior and posterior roots of the acoustic. 4. The trapezoid body contains fibres originating from the anterior nucleus which have the same importance as one of the branches of the T-shaped division of the nerve process of the more peripheric cells belonging to the anterior nucleus itself. 5. In the posterior root of the acoustic the inner portion (N. cochlearis) develops from the nervous network of the anterior nucleus. The outer portion (striæ acusticæ) originates for the greatest part from nerve cells of the tuberculum laterale, for the smaller part also from more centrally located cells of the anterior nucleus. 6. Between the anterior root of the acoustic and the cerebellum there exists a connection by means of fibres, which arise from the anterior root and pass through a portion of the crus cerebelli, then run along the lateral wall of the fourth ventricle, and finally end in the embolus and in the nucleus of the tegmen. 7. The anterior root of the acoustic contains fibres which originate from the corpus restiforme. 8. The more peripheric portion of the anterior nucleus should be considered as a real peripheric ganglion which, analogous with the spinal ganglia, belongs to the anterior root and to the inner portion of the posterior root of the acoustic nerve.

12. The connection of the cerebellum is threefold, by the connecting crura, the crura ad pontem, and the restiform body. The latter terminates in the vermiform process of the same and the decussated side; collaterals pass to the convolutions of the hemispheres and the nucleus dentatus. Collaterals pass also to the posterior nucleus of the acoustic, the Deiters' nucleus, the vestibular main nucleus, viz., the primary end region of the vestibular nerve. The primary end region of the N. vestibularis is the entire gray floor and the lateral wall of the fourth ventricle, for the N. cochlearis the anterior of the acoustic and the tuberculum acusticum. The inner portion of the restiform body contains the descending partial branches of the N. vestibularis, which end toward the spinal cord with collaterals. The formatio reticularis also, the central gray matter of the cavities, and the decussated half of the brain trunk are primary end regions of the abovementioned nerves. The secondary sensory paths enter: *a*, the remainder of the antero-lateral fascicle of the middle line (of the same and decussated side); *b*, the intermediary olivary layer (de-

cussated); *c*, lateral fields of the formatio reticularis (of the same side). A special secondary path of the vestibular nerve originates from the vestibular main nucleus and enters the remainder of the antero-lateral fascicle. In the central gray substance of the ventricles of the medulla oblongata, there occur, in addition, sensory branches of radical fibres of the vestibular nerve. ASHER.

b.—NOSE AND NASO-PHARYNX.

1. ANTON, W. Contribution to the knowledge of congenital deformities of the nasal septum. *Arch. f. Ohrenheilk.*, vol. xxxv., p. 304.

2. RANGE, M. Macroscopical investigations upon Jacobson's organ. *Cmpts. rend. de la soc. franç. d'otol. et de laryng. Revue de Laryng.*, etc., 1893, p. 597.

3. ROESE, C. The nasal gland and the palatal glands of Crocodilus porosus. (From the Anatom. Inst. at Freiburg i/Br.) *Anat. Anz.*, 1893, p. 745.

4. MANASSE, P. Pathologico-anatomical communication from the aural clinic of the university at Strassburg. *Virchow's Archiv*, vol. cxxxiii., p. 389.

5. WRIGHT, JONATHAN. Some remarks on the structure of œdematous nasal polypi. *N. Y. Med. Journ.*, Nov. 4, 1893.

6. WINKLER, E. Contribution to the anatomy of the lower wall of the frontal sinus. *Arch. f. Laryng. u. Rhinol.*, vol. i., No. 2.

7. RABE-RÜCKHARD, H. The lobus olfactorius impar of the Selachians. *Anat. Anz.*, 1893, p. 728.

8. SCHMIDT, Prof. Dr. M. The lateral diverticles of the naso-pharyngeal cavity. *Archiv f. Laryng. u. Rhinol.*, vol. i., p. 32.

1. ANTON found, among 65 autopsies of new-born made at Chiari's Institute, nine deformities of the nasal partition wall, viz., in one case a pure deviation, in the remaining eight formation of spurs with deviation of the septum.

2. The lecture, which was illustrated by demonstration of sections and drawings, contains no novel features.

3. The heretofore much discussed question of the occurrence of nasal glands in crocodiles, is answered positively. In addition, palatal glands could be demonstrated.

4. MANASSE found within three weeks, in four individuals,

nasal polypi with formation of bones, which, after their entrance into the polypi, ramified dendritically and appeared as small tubes with a fully developed medullar cavity. In one case there was found also in the fibrous portions of the polypus a considerable accumulation of pigmented cells,—at any rate, blood pigment from former extravasations.

5. WRIGHT describes the change of the cylindrical to the squamous epithelium, which takes place upon surfaces exposed to air and friction. This change, although observed by others in gelatinous polypi, could be observed by him only in growths without œdema, particularly in sarcoma, and is illustrated by three photographs. He demonstrates also thickening of the layers—frequently in form of scalloped fringe in a section through hypertrophy of the middle turbinated body. The *stroma* of polypi consists of a network of areolar tissue with long spindle-shaped cells, the meshes being filled with fibrin. The œdematous fluid contains serum, albumen, and mucin. Exudations of small round cells from the blood-vessels with production of young connective tissue in some sections, give rise to mistakes with sarcoma. Billroth's view of the prevalence of mucous glands in mucous polypi is modified by Wright, who finds fewer glands in them than in the normal tissue. There is no true adenoma in the nose. Blood-vessels are small and scanty in polypi. Cyst formation is occasionally a striking feature, and is due to degeneration of glands or to the breaking down of dilated areolar spaces into one or more cavities, or to dilatation of blood-vessels, which, however, never occurs in gelatinous polypi. Myxoma may occur in the nose, but is not the usual character of gelatinous nasal polypi, which result from chronic inflammation. Polypi are also associated with empyema of the antrum ; but this is either due to ethmoid suppuration or to occlusion of the hiatus semilunaris by polypi, or it is most frequently of dental origin. Polypi do not recur from the stump left, but from the adjacent mucous membrane, which ought to be cauterized. The base of the growths is reached with much difficulty. M. TOEPLITZ.

6. WINKLER examined in 33 cadavers of from twenty to eighty years of age, the frontal sinuses with reference to size, possibility of probing, and perforation from the nose, and of making inferences from outer signs as to the condition of the cavities. There exist no external indications for the diagnosis of the size of the cavities or the thickness of the walls. Of the male cadavers, not

quite one sixth, of the females one fourth of the frontal sinuses could be probed ; on the other hand, about one half of all cases could be trephined from the nose. The zincographs might have been somewhat better.

7. The lobus olfactorius impar described by Kupffer in embryos of acipenser, could also be demonstrated in embryos of *acanthias.*

8. SCHMIDT found, after many futile inquiries, successively in the living three cases of congenital diverticles of the naso-pharyngeal cavity, which must have been due to the second branchial fissure. They are not of practical importance.

B.—PHYSIOLOGY AND PHYSICS.

a.—HEARING ORGAN.

1. SACHS, R. Observations on the physiological condition of the hearing organ of the new-born. (From the policlinic of the university at Goettingen.) *Archiv f. Ohrenheilk.*, vol. xxxv., p. 28, 1893.

2. FUCHS, Prof. FR., Bonn. A case of subjective aural and facial sensations. Auto-observation. *Neurol. Centralbl.*, 1893, p. 777.

3. URBANTSCHITSCH, V. Reciprocal actions between both hearing organs. *Arch. f. Ohrenheilk.*, vol. xxxv., p. 1, 1893.

4. GALTON, FR., and GRUBER, ED., of Jassy. Colored hearing and similar phenomena. *Congrès de psychol. expérim. de Londres*, 1892.

5. BARTH, A. Contribution to the theory of hearing in the inner ear. *Sitzungsber. der Ges. zur Befoerderung der gesammten Naturwissenschaften zu Marburg*, No. 4, 1893.

6. STEIN, Prof. Dr. VON. Apparatus for the determination of the deviations of the static functions of the aural labyrinth and its demonstration. *Congrès Zoöl. Internat. à Moscow*, 1892.

7. KREIDL, A. Contribution to the knowledge of the organ of equilibrium. *Centralbl. f. Physiol.*, 1893, No. 6.

8. MATTE. Contribution to the function of the semicircular canals of the labyrinth. *Inaugur. Dissert.*, Halle, 1892.

9. HENSEN, Prof. Lecture against the sixth sense, delivered before the physiological society at Kiel, on June 12, 1893. *Arch. f. Ohrenheilk.*, vol. xxxv., p. 161.

10. MELDE, Prof. Some methods for the determination of the numbers of vibrations of high notes. *Sitzungsber. der Ges. z. Befoerd. d. ges. Naturw. in Marburg*, 1893, No. 5.

11. MELDE, Prof. Resultant tones. *Ibidem*, 1893, No. 16.

1. Children in half sleep are best adapted to these investigations. The twenty children exhibited all a marked reaction to noises, in isolated cases a weak reaction on tones, viz., the high notes (c^2 and c^3) were better perceived in most cases, in some exclusively. Some children reacted on noises only, not on notes. (Would the reaction on high notes coincide with that of "noises," if the so-called noises had been replaced by tones of the fourth, fifth, and sixth octave?—REVIEWER.)

2. FUCHS observed for years, in the transitory state between being awake and asleep, acoustic sensations corresponding to the perceptions during contractions of the tensor tympani. These phenomena of sound, frequently combined with a sensation of light, can be produced at will by movements of the jaw. The contraction of the tensor tympani may take place in a threefold manner: 1. Spontaneously or in attacks, viz., by excitation of the motory centre of the tensor tympani through inner influences of unknown origin. 2. By associated movements, viz., by volitional innervation of the centre for the ascending and descending movement of the lower maxilla and the extension of the excitation to the motory centre for the tensor tympani. 3. As reflex, viz., by transmission of the excitation from the acoustic nerve, irritated by external causes, to the motory path for the tensor tympani.

3. URBANTSCHITSCH distinguishes reciprocal relations between both hearing organs: *A*, Homogeneous reciprocal effects; *B*, Heterogeneous reciprocal effects. The homogeneous effects may be: I., vasomotor; II., trophic; III., sensory; IV., functional. The functional effects depend upon processes of: *a*, sensation; *b*, accommodation. The phenomena of homogeneous mutual relations in both ears are with reference to their reciprocal condition: 1, analogous; 2, alternate; 3, contrary. Heterogeneous effects are produced by influencing the hearing function in one ear through actions upon the sensory nerves of the other ear. These different mutual relations occur either separate, or interchanging, or together; the same etiological agent may thus induce from one ear to the other at a time one phenomenon, at another time another phenomenon. The different chapters are discussed with reference to the literature and illustrated by examples.

4. The authors at least place from the beginning the phenomena of colored audition where they belong, viz., not among the perceptions of sensation, but among the associations, which always exhibit subjective coloring. The ingenious plaything, which presents sensations of different senses as being more or less allied, soon ought to disappear at least from the exact sciences through investigations like these. Apart from the audition, "colored vision, gustation, olfaction, tactility, temperature, resistance, and mobility" are mentioned; besides, of course, gustatory vision, audition, etc.; then, olfactory vision, etc. It does not suffice, however, that two or more perceptions of sense are combined; there appear even more or less colored mathematical figures, rows of figures *a*, *o*.

5. BARTH arrives at the following conclusions: 1. We should suppose that the vibrations of sound transmitted to the ear are propagated in the inner ear as genuine sound waves, not as movement in masses. 2. The relative position of the parts of the inner ear to one another and to the entering sound waves renders it quite probable that a certain rôle may be attributed in the hearing, apart from other functions, also to the vestibule and the semicircular canals. 3. The acoustic excitation is not to be considered as an extremely undisturbed vibration of Corti's organ associated with the endolymph, but also as a disturbance in the intention of associated vibration, viz., as deadening or consuming the movement of sound.

6. VON STEIN has devised an apparatus consisting of two boards, which may be regulated at different angles to each other by ropes running over an axle-tree wheel. The size of the angle may be read from a sector. Von Stein calls it the "static goniometer." In placing one board horizontally and upon the other near the axis of movement, the individual to be examined, normal persons lose the equilibrium in raising the board at an angle of from 35° to 40°. In pathological cases the angle measures 20° and less. The examination upon the inclined plane is combined with closure of eyes and feet, and standing on tiptoe. The aural affections are divided with reference to disturbances of the equilibrium into three classes: 1. Complete loss or decrease of the faculty of hearing with disturbance of equilibrium. 2. Simple disturbances of equilibrium, in which movements in one distinct direction are impossible. Since in these cases the faculty of hearing also was not quite intact, the author assumes that in

cases of disturbances of equilibrium the affection should be located away from the inner ear, if the hearing is normal. 3. The group of mixed cases composed by 1 and 2. These most frequently occur to the physician.

7. KREIDL fully describes the condition of the individual, which in the rotatory experiments deviated from the normal. The man never suffered from vertigo ; even in intensities of current of from 15 to 20 milliamp., conducted through the head. All typical head movements are missing in closing and opening the current. He could on the merry-go-round exactly determine the vertical ; with the eyes closed, however, he could hardly stand on one leg. Kreidl assumes in this case a deficient intra-uterine development of the otolithic apparatus.

8. From experiments made on pigeons in the physiological laboratory at Halle, MATTE arrived at the conclusion that the semicircular canals are of extreme importance for the movement of the head, and secondarily for the movements of the body.

9. HENSEN sharply criticises the latest papers on the function of the semicircular canals, simultaneously protesting against the reproach that he undervalues scientific investigations. He thinks it at least to be quite doubtful whether the inner ear is of any importance for the equilibrium, as it is at present wellnigh generally believed. At any rate, it is thoroughly unjustifiable to speak in this respect of a sixth sense. On the other hand, he emphasizes the fact that the vestibular terminations should be positively considered as important for the hearing.

10. The tone can be transmitted to a glass tube and the number of vibrations easily determined from Kundt's dust-waves according to a given formula. According to this method tones can be determined up to 8000 vibrations.

b.—NOSE AND NASO-PHARYNX.

1. ZWAARDEMAKER, Utrecht. Contribution to the methods of clinical olfactometry. *Neurol. Centralbl.*, 1893, p. 729.

2. FRANKE, G., Berlin. Experimental investigations upon aërial pressure, movement, and change in the nose and its accessory cavities. *Arch. f. Laryng. u. Rhin.*, vol. i., p. 230.

1. An olfactometric method requires: 1, that it elicits, to begin with, the weakest irritations, and passes gradually to the

strongest ones; and, 2, that we may rapidly and continuously rise from the weakest to the strongest olfactory irritations. Both requirements are almost perfectly fulfilled by the author's method with cylinders placed one upon another.

2. The experiments were made upon a model connected with the mouth or nose. The balance of pressure between the outer and nasal air depends upon: 1, the difference of pressure—the larger the difference, the more rapidly the masses of air are moved; 2, the size of the communicating opening—the smaller the opening, the longer the equalization lasts; 3, the amount of air—the smaller the volume, the more rapidly is the equilibrium restored. The difference of pressure between inspiration and expiration is explained: 1, by the inspiration requiring a large muscular exertion, whilst the expiration takes place principally by muscular relaxation, weight of thorax, elasticity of the lungs, and the extended abdominal contents; 2, by being accustomed to extreme expiratory, but weak inspiratory, movements (cough, hawking, etc.—snuffling, snivelling); 3, by warming of the expiratory volume of air, which thus becomes larger than the inspiratory one; 4, by the longer duration of expiration than of inspiration. The amount of aërial pressure in the accessory cavities is determined: 1, by the absolute capacity of the entire nasal cavity; 2, by the relative size—viz., by the difference between the anterior and posterior nares, and the other narrowest passage respectively; 3, by the location of the narrowest transverse section of the nasal cavity; 4, by the amount and force of the respiratory movements. The aërial pressure in normal noses and their accessory cavities amounts to 2–3 *mm* water to the utmost in normal respiration. The author does not believe in an influence of this slight pressure upon the form of the nose. During inspiration the aërial current ascends from the nostril to the nasal roof, whence it descends to the posterior nares. At the nasal floor a vortex is formed in the same direction. The current of expiration takes the same course, but in the opposite direction. The accessory cavities present quite unfavorable relations for the renewal of their air during respiration; they have no function. Their size and development is independent from the different respiratory relations, as well as the width of the nasal cavities from the amount of respiratory pressure.

II.—PATHOLOGY AND THERAPEUTICS OF THE EAR, NOSE, AND NASO-PHARYNX.

By Dr. ARTHUR HARTMANN, Berlin.

Translated by Dr. Max Toeplitz, New York.

GENERAL LITERATURE.

1. Lemcke, Prof. Report on the policlinic of the university at Rostock for aural, nasal, and laryngeal diseases from July 1, 1891, to July 1, 1893. *Arch. f. Ohrenheilk.*, vol. xxxvi., p. 55.

2. Gunnert and Panse. Annual report on the work done at the aural clinic of the university at Halle from April 1, 1891, to March 31, 1892. *Arch. f. Ohrenheilk.*, vol. xxxv., p. 231.

3. Bezold, Prof. Preliminary communication on the examination of the royal institute for deaf-mutes at Munich. *Münchener med. Wochenschr.*, No. 48, 1893.

4. Argentowski, B. Gellé's centripetal pressures. Their diagnostic and prognostic importance and their relation to other aural examinations. Zurich, 1893.

5. Urbantschitsch, Prof. V., Vienna. The possibility of attaining marked results by acoustic exercises even in such deaf-mutes, who have been heretofore considered as beyond hope. *Wiener klin. Wochenschr.*, 1893, No. 29.

6. Hecht, Lohnan. Clinical contribution to the use of cocaine in otology. *Munch. med. Wochenschr.*, No. 37, 1893.

1. Among 1030 patients, 73 requiring decidedly clinical treatment had to be treated at their residences on account of absence of an especial clinical department. Only the most urgent cases could thus be attended to. We emphasize from the report, that Lemcke expressly points to the examination and treatment of the nose and naso-pharynx in aural affections. Among 133 cases of acute otitis media the history and condition of 79, = 59.5 %, decidedly favored the assumption of the development of the aural affection from nasal and pharyngeal affections. In one case, the successful treatment confirmed the view, that " deaf-mutism is not quite unfrequently due to curable diseases of the sound-conducting apparatus as primary causes, and that beginning deaf-mutism may be retarded, reduced, and restored to the former condition by proper treatment." Rumler (Berlin).

2. 1662 patients were treated. At the stationary clinic 185 patients were cared for. The hammer was excised from the external meatus in 26 cases; the incus together with the malleus in 17. Among 9 mallear excisions, 5 were permanently cured; among 17 malleo-incudal extractions, 8. In two cases, the stapes was extracted together with the malleus without appearance of vertiginous or other unfavorable signs. The histories of six lethal cases are fully reported and also those of some interesting cases.

RUMLER.

3. The investigations made under the most careful precautions attempted only the determination of eventual remnants of hearing power in deaf-mutes. This can only be made with BEZOLD'S well-known continuous series of tones. The examinations were made only as to aërial conduction on account of the incapability of most deaf-mutes of distinguishing the sensation of vibrating from that of hearing. Among 158 hearing organs, 48 were totally deaf (15 individuals only bilaterally); among 28 the extent of hearing was limited to small continuous distances of the scale: "islands" (group I.); among 20 "tone-gaps" were found (defects within the continuity of the scale), viz., 16 plain and 4 double ones; multiple tone-gaps could not be positively demonstrated (group II.); in one case the entire upper range down to g^2 was missing, with perception preserved in the lower (group III.); in 8 cases defects were found simultaneously at the upper and lower tone limit (group IV.); in 18 cases, large defects at the lower, inconsiderable ones at the upper part (group V.); in 33 cases, also inconsiderable defects at the upper, but no very large ones either at the lower end, of from 4 to ½ octaves (group VI.). From the total synopsis of the groups it follows, that defects are more frequent and extensive at the lower end of the scale than at the upper.

MÜLLER (Stuttgart).

4. The dissertation made under the guidance of F. Rohrer of Zürich, begins with entering fully into the discussions of the methods and effects of centripetal pressures upon the healthy ear and of Gellé's different attempts at explanation. The second part communicates the results attained by Rohrer in 375 aural patients examined in this direction for aërial and bone-conduction. From the extensive and tabulated experiments it follows, that in all examined forms of disease (viz., in those of the labyrinth and also of the middle ear) the contripetal pressures have in more than 50 per cent. the same positive result as in the normal ear,

viz., they decrease bone- and aërial conduction. In primary labyrinthine affection 73.6 per cent., in "sclerotic processes" 51 per cent., Gellé's experiment, decreased simultaneously both aërial and bone-conduction. In primary affections of the labyrinth, the pressures produced changes only in 11.1 per cent., in sclerotic processes in 8.6 per cent. The greatest percentage of missing reaction was found in adhesive processes, viz., 27.8 per cent. against large percentages of entirely or partially missing reaction in labyrinthine affection. In the third part, the results of Webers', Schwabach's, and Rinné's experiments and of the examination of the upper tone limits are tabulated for the different forms of disease with reference to the result of the centripetal pressures. The results communicated in the second part, as it results from the above-mentioned figures, can hardly be considered as proof for the conclusions of the author, that the negative result of Gellé's experiment—if the mobility of the membrana tympani is supposed to be preserved—indicates fixation of the stapedial plate. It is, however, quite worthy of consideration in this direction, as emphasized by the author, that, on the one hand, the cases with negative Rinné and, on the other hand, those with negative (viz., without reaction) Gellé are approximately (100 : 90.5) the same. SIEBENMANN.

5. Methodical acoustic instruction may teach deaf-mutes : (1) how to separate and interpret acoustic impressions, and (2) how to excite their acoustic activity by which a gradual increase of perceptibility is rendered possible. URBANTSCHITSCH orders in the beginning acoustic daily exercises of half an hour's duration, later on of at least one hour, if possible, without hearing tubes. The sound transmitted to the ear ought to be only of an intensity that is absolutely necessary for the production of the corresponding acoustic excitation. POLLAK (Vienna.)

6. Auto-observation of a colleague, not an aurist ; after two instillations of a 5 per cent. solution of cocaine, deafness, which had suddenly appeared five days previously with subjective noise, was completely removed. In conjunction with this observation, the author quotes the communications of M. von Stein and Kiesselbach on the use of cocaine in otology. MÜLLER.

INSTRUMENTS AND METHODS OF EXAMINATION.

7. SCHUBERT. A novel magnifying glass for the membrana tympani. *Arch. f. Ohrenh.*, vol. xxxvi., p. 79.

8. JANKAU, Munich. Otological contributions. *Wiener med. Presse*, 1893, No. 44.

9. CALDWELL, GEO. W. Transillumination of the accessory sinuses of the nose. *N. Y. Med. Journal*, Nov. 4, 1893.

10. PHILIPPS, WENDELL C. A modified electrical head illuminator. *Medical Record*, July 8, 1893.

11. SCOTT, EDWARD A. An aseptic nasal speculum. *N. Y. Med. Journ.*, Dec. 9, 1893.

12. WINKLER, Bremen. Preliminary communication on a novel lamp for examination. *Münch. med. Wochenschr.*, No. 36.

13. WAGNER, R., Halle. The use of mirrors in rhinoscopia anterior. *Münch. med. Wochenschr.*, 1893, No. 10.

14. LIEVEN, Aachen. In-drawing of the alæ nasi in chloroform narcosis. *Münch. med. Wochenschr.*, 1893, No. 22.

15. RÉTHI, L., Vienna. A mirror for endo-nasal inspection. *Prager med. Wochenschrift*, 1893, No. 42.

16. BATES, W. H. New instruments for the removal of adenoid tissue. *Medical Record*, Sept. 2, 1893.

17. GIBBONS, PETER J. An adenotome for the removal of adenoid growths in the vault of the pharynx. *N. Y. Medical Journal*, Oct. 21, 1893.

18. BUTTS, H. HOYLE. A new instrument for controlling tonsillar hemorrhage. *Medical Record*, July 1, 1893.

19. GLEITSMANN, J. W. A multiple powder blower. *N. Y. Med. Journ.*, July 22, 1893.

7. In order to eliminate disturbing reflexes SCHUBERT inserted at the inner end of the aural speculum a plane convex lens, upon the plane surface of which a small glass prism is pasted. A double effect is thus reached: (1) the reflex of the plane surface is deflected by the prism and of no further consideration; (2) with the same refracting power, the radius of the convex surface in the plano-convex lens is rendered smaller by one half than that of a bi-convex lens, and, with the decrease of the radius, also the reflex image is smaller. RUMLER.

8. 1. An apparatus for auto-application of Politzer's air douche. A double balloon, the air-containing ball of which made of strong rubber, is by means of a rubber-tube provided with a stop-cock of wide calibre and an easily-working valve, the end attachment being olive-shaped in order to introduce it readily

into the nostril. With every turn of the valve at 180° an amount of air sufficient for the air-douche should pass. 2. Modification of Duplay-Chanièré's nasal speculum. Placing the screw backward. POLLAK.

9. The paper is a mere description of the method of transillumination, which is considered by Caldwell as one of the most valuable agents of diagnosis we possess.

M. TOEPLITZ.

10. The instrument carries a six-volt, four-candle-power lamp and is attached to a forehead metal band, which is held on the head by a steel band running sagitally. It resembles very much the illuminator as manufactured by Hirschmann at Berlin.

M. TOEPLITZ.

11. The instrument is so constructed, without angles and furrows, as not to afford shelter to any impurity. The disadjustment is effected by simply pressing and then turning the retaining spring, after which the two handles are easily unlocked by approximation. M. TOEPLITZ.

12. The new lamp used for the first time the arc light for medical purposes; it can, therefore, be supplied only by an electric plant. It resembles Krause's lamp, and stands upon an iron stand with castors. The base rests upon a ball joint. The light, furnished by a small arc lamp of about 2 amp. intensity, is equal to from 150 to 200 normal-candles, and extremely steady. The lamp is manufactured by the firm of Schuckert at Nuremberg.

MÜLLER.

13. For inspection of the anterior portion of the nose, small mirrors, which are to be introduced into the nose, are recommended in suitable cases (illustration). MÜLLER.

14. LIEVEN, to prevent the alæ nasi from being drawn in, owing to the loss of volitional contraction and tonus of the mm. dilatatores and levatores, advises to supplement the outfit for narcosis by a nasal opener according to M. Schmidt or by a shirt button according to Schmidthuisen. MÜLLER.

15. The mirror devised by RÉTHI (manufactured by Reiner, Vienna, Franzensring 22), for introduction into the nose, is said to have the advantage that changes of position of the mirror can be made without exertion, gradually and equally and without jerks, that the mirror remains in a given position, and that the rod, in turning the mirror, does not jerk backward, thereby striking the septum. POLLAK.

16. The first instrument is of the shape of a Loewenberg forceps, but presents instead of the spoons, two conical ring-knives, which, when coming together, act like a pruning-hook and cut like a punch. The second instrument resembles a slender ear forceps with long arms and cutting blades as tips, similar to those of the first instrument, but smaller, and is introduced through the nose. M. TOEPLITZ.

17. The distal extremity of the instrument which is placed at right angles with the shank, resembles the knife and frame of Mackenzie's tonsillotome, whilst the proximal end works like Bosworth's porte-caustique. M. TOEPLITZ.

18. As a substitute for digital pressure BUTTS devises a tonsillar hemostat which measures six and three quarter inches in length and consists of two parallel steel blades four inches long, locked at the juncture with the handles. The tips of the blades are curved backward and outward, and hold ovoid pads for compressing the bleeding portions. The handles are connected by a threaded rod, upon which a milled wheel travels from the outside and a spring is inserted between the handles. A bibliography of forty-six tabulated cases concludes the paper.

M. TOEPLITZ.

19. The instrument, a modification of Politzer's powder blower, has three movable cups on a stationary canula, with which they communicate when turned upward, so as to then allow the powder to fall through. By turning the cups downward, they can be used separately or combinedly. M. TOEPLITZ.

EXTERNAL EAR.

19a TREITEL. Diphtheria of the external meatus. *Deutsch. med. Wochenschr.*, 1893, No. 52.

19a. A delicate boy, aged three, suffered from pharyngeal diphtheria. There appeared, in addition, membranes at the angles of the mouth and nose, extreme cervical glandular swellings, and paralysis of the right facial. After a few days, both external meatuses were found to be filled with a thick, whitish membrane, which came off spontaneously as a perfect cast of the cartilaginous external meatus. The middle ear was apparently intact. The examination of the membrane for bacilli of diphtheria resulted in bacilli resembling them, but culture experiments were without success. The author does not doubt it to have been a case of genuine diphtheria. NOLTENIUS (Bremen).

MIDDLE EAR.

20. KOSSEL, H. Suppurations of the middle ear in infants. *Charité Annalen*, vol. xviii. (From the Institute for Infectious Diseases at Berlin.)

21. GRUNERT, Halle. The cause and importance of retention of pus in the ear.

22. WEIL, E., Stuttgart. Purulent otitis media. *Württemb. Correspondenzbl.*, 1893, No. 25.

23. COHEN-KYSSER, Hamburg. Contribution to the treatment of deafness. Preliminary communication. *Münch. med. Wochenschr.*, 1883, No. 34.

24. RAOULT, A., Paris. Perforations of Shrapnell's membrane. *Soc. d'édit. scient.*, 1893.

25. LEMCKE, Prof., Rostock. Hyperostosis of the petrous bone in chronic aural suppuration and its relations to intracranial affections of aural origin. *Berl. klin. Wochenschr.*, 1893, Nos. 37 and 38.

26. PANZAT, J. E. Osteomyelitis of the temporal bone as a complication of otitis media purulenta. *Annal. des mal. de l'oreille*, etc., 1893, No. 9.

27. SIEBENMANN, F., Prof. Further contributions to the etiology and treatment of cholesteatoma of the middle ear. *Berl. klin. Wochenschr.*, 1893, No. 38.

28. HABERMANN, Prof. Dr., Graz. Cholesteatoma of the middle ear. *Mittheilungen des Vereins der Aerzte in Steiermark*, 1893, Nos. 8 and 9.

29. EITELBERG, A., Vienna. Contributions to the extraction of the malleus. *Wien. med. Wochenschr.*, 1893, No. 28.

30. MEYJÈS, W. POSTHUMUS. Treatment of progressive and stable deafness and chronic otorrhœa by removal of the ossicles. *Nederl. Tydschr. voor Geneesk*, 1893, i.

31. GRUNERT. Stacke's operation for exposing the cavities of the middle ear during the second year of its use at the royal aural clinic at Halle. *Arch. f. Ohrenheilk.*, vol. xxxv., p. 198.

32. ROHRER, F. Secondary periostitis of the mastoid process. *Arch. internat. di Rinologia*, etc., Barcelona, 1893.

33. GRUNERT. The body temperature after the mastoid operation. *Arch. f. Ohrenheilk.*, vol. xxxv., p. 178.

34. GRUNERT. Cured case of pyæmia ex otitide; ligation of the jugular vein; injections through the peripheric end and transverse sinus. *Arch. f. Ohrenh.*, vol. xxxvi., p. 17.

35. KOCH. Some aural operations. *Berl. klin. Wochenschr.*, 1893, p. 45.

36. ZAUFAL, Prof., Prague. Demonstration of two cases of pachymeningitis suppurativa externa cured by trephining. *Prag. med. Wochenschr.*, 1893, No. 45.

37. ZAUFAL, Prof. E., Prague. Clinical contribution to the otitic pachymeningitis suppurativa externa. *Prag. med. Wochenschr.*, 1893, No. 50.

38. SCHEIER. Cerebral abscess after purulent otitis media cured by operation. *Berl. klin. Wochenschr.*, 1893, No. 36.

39. KRETSCHMANN, Magdeburg. Contribution to the treatment of the otitic cerebral abscess. *Münch. med. Wochenschr.*, 1893, No. 29.

40. JANSEN. Contribution to the knowledge of the deep-seated extradural abscesses in the posterior cerebral fossa, produced by labyrinthine suppuration. *Arch. fur Ohrenheilk.*, vol. xxxv., p. 291.

41. JANSEN. Cerebral sinus thrombosis after suppuration of the middle ear. *Arch. f. Ohrenheilk.*, vols. xxxv. and xxxvi.

42. GENDRE and BEAUSENAT. Staphylococcus infection; otitis, meningitis, and arthritis suppurativa; broncho-pneumonia; death. *Bull. et mém. de la soc. méd. des hôp.*, 1892, No. 28.

43. SCHWIDOP. A case of sarcoma of the base of the skull with secondary affection of the petrous bone. *Arch. f. Ohrenheilk.*, vol. xxxv., p. 39.

44. UCHERMANN, Christiania. Stacke's operation. *Norsk. Mag. for Laegevidenskab.*, 1893, June.

20. KOSSEL, at the autopsies of infants, found the tympanic cavity so frequently filled with purulent exudations, as to undertake the study of these otitides mediæ of infants from a large material of autopsies. In accordance with former observers, he thus arrived at the conclusion that the inflammation of the middle ear plays an important part in the most different diseases of infants. In 188 autopsies of children up to one year, exudations were found in the tympanic cavity in 85 cases. These inflammations lead but rarely to perforation of the membrana tympani

and are thus most frequently overlooked during the examination of an affected child. In a group of cases the inflammation of the middle ear was to be considered as a complication of an acute infectious disease of the air passages. The acutely affected child exhibited the symptoms of a catarrhal difficulty of the air passages with broncho-pneumonic foci in the lungs under high fever. The appearance in these cases of a micro-organism closely allied to the influenza bacillus is important; it was found in the exudations of the middle ear and also in the broncho-pneumonic foci, in pure cultures or by far preponderating over other bacteria, and it was designated by Kossel in accordance with R. Pfeiffer as pseudo-influenza bacillus. In the second group of cases, the children did not present acute symptoms, but the well-known picture of atrophy. The affection of the ear, at any rate, is here to be considered as an extremely important complication, even as cause of the occurrence that children, during the first development of atrophy, frequently cannot be saved even with the best nourishment and the most attentive care. The four observations of extensive thromboses of the venous sinuses of the cerebrum and a case of meningitis purulenta in otitis presents the close relations of the otitides of infants also to cerebral affections. Extensive œdema of the soft meninges was in most cases of otitis media considered as the immediate cause of death. The suppuration was bacteriologically examined in 38 cases. The above-mentioned pseudo-influenza bacillus was found in 19 cases, 9 times in pure cultures, 10 times with Fraenkel's diplococcus, 4 times with streptococci, twice with Friedlaender's bacillus, twice with staphylococci, once with bacillus pyocyaneus. Fraenkel's diplococci were found in 6 cases, bacillus pyocyaneus in 3, streptococci in 3, Friedlaender's bacilli in pure culture in 1, Fraenkel's diplococci and streptococci in 1, streptococci and Friedlaender's bacilli in 3 cases. The otoscopic diagnosis is, according to Kossel, rendered extremely difficult by the anatomical relations of the infantile ear. He succeeded only in older infants. Sudden rise of temperature, appearance of somnolence, violent crying, etc, and also permanent decrease of bodily weight, together with the absence of other symptoms of disease, should in infants direct the suspicion to the ear. Kossel has heretofore not instituted any therapeutic procedures (paracentesis).

AUTO-REVIEW.

21. Lecture delivered before the Medical Society at Halle.—

Purulent meningitis, otitic cerebral abscess, purulent sinus phlebitis with consecutive pyæmia are much more frequently, as is generally assumed, the consequences of neglected aural suppurations. Apart from the location of the hearing organ relative to the brain, particularly the retention of pus favors the development of these diseases. Retention of pus is favored in the first place by the anatomical structure of the ear and principally by the anatomical relations of the cupolar cavity. The pus retained therein will readily cause empyema of the mastoid process with its dangers, or it burrows a path through Shrapnell's membrane, or it passes through the tegmen tympani (congenital dehiscences) into the cerebral cavity. Apart from the structure of the middle ear, secondary furuncles of the external meatus, granulations, exostosis, hyperostotic stenosis, atresia, burrowing abscesses of the external meatus are of importance. Finally, there exists artificial retention, as it is principally incurred by powder treatment. The treatment of otorrhœa should direct its main attention to the prophylaxis of retention of pus. MÜLLER.

22. In the lecture delivered before the meeting of the physicians of Württemberg, WEIL fully dwells upon the modern views on acute otitis media purulenta, its prophylaxis and treatment. In discussing the prophylaxis he warns especially against the imprudent use of the nasal douche, of which he is so much afraid, as to forbid it to his patients. He ascribes an important part also to improper blowing of the nose. With reference to treatment, he warns against the aërial douche during the stage of inflammation and advocates early paracentesis. He cannot conceive why this operation is not practised more during the academical studies, for according to his views, its knowledge is more important than the great operations, resections, etc. He concludes with the discussion of the participation of the mastoid process. MÜLLER.

23. The preliminary communication records the fact, that, for more than one year, in chronic atrophic catarrh of the middle ear and remnants of cured suppurations, inasmuch as connective tissue formations and tissue metamorphoses had been the cause of deafness, COHEN-KYSSER had made injections of artificial and natural stomach juice, papayotine, and a new ferment isolated from the latter, into the middle ear—for the digestion of these pathological products,—and that he has thus generally arrived at satisfactory results. He injects from the external meatus at two places, at the

upper posterior quadrant and above the short process; in defects of the membrana tympani instillations are sufficient. MÜLLER.

24. RAOULT'S paper is divided into three parts: an anatomical, etiological, and a clinical part. In the latter, the main complications of the suppurations of the attic are discussed: cholesteatoma and polypi. According to the author, the most frequent cause of suppurations is the catarrh of the Eustachian tube in consequence of acute inflammations of the nose and pharynx. The other causes are very rare and doubtful. The treatment consists in irrigations through the cupolar space by means of Hartmann's antrum tube with antiseptic fluids, extraction of the carious ossicles, curettement of the cavity.

GELLÉ.

25. Contrary to the view that hyperostosis of the petrous bone, frequently found in chronic suppurations, form a protective wall for the cerebrum and its meninges against the suppurative processes advancing from the middle ear and mastoid antrum, LEMCKE points to the danger of this complication. The hyperostosis is not found in all parts of the ear, but well-nigh exclusively at the mastoid process and in the external meatus which is stenosed. The products of suppuration must break through in the direction of the smallest resistance, viz., into the cerebral cavity, if the stenosed external meatus is still further obstructed by swelling or polypi. In support of his views, Lemcke quotes the histories of fifteen patients, in whom sclerosis and hyperostosis were found. All the patients had suffered from suppuration of many years' standing, and had been earlier or later associated with dangerous general symptoms. Lemcke describes the symptoms of osteosclerosis, which he recognizes as a serious and dangerous complication, as a, in a measure, uniform picture, as follows: The most marked indication is the contrast between the symptoms of a deep-seated inflammation and the normal result of examination of the mastoid process and the surroundings of the external ear. At the bottom of the external meatus osseous stenosis or swelling of the soft tissues are found, the latter principally at the upper and posterior wall. The drum-membrane is mostly perforated; there is caries in the tympanic cavity, the discharge not very copious, but very offensive. A cure can be effected only by timely operation. RUMLER.

26. PANZAT draws from his paper the following conclusions: 1. Osteomyelitis of the temporal bone may appear in acute, sub-

acute, or even in chronic form. It forms a frequent complication of the chronic purulent otitis media. 2. The development and comparative frequency of this disease is naturally explained by the fact, that the microbes of osteomyelitis are normally found in purulent otitis media. 3. From a clinical standpoint, there are known at present: *a*, a type of acute osteomyelitis, affecting the entire pyramid of the temporal bone, the mastoid process, or at least its inner portions, and even the adjoining part of the occipital bone; *b*, different kinds of acute or subacute osteomyelitis are limited to the anterior upper portion, or to the entire mastoid process, the osseous part of the external meatus, etc. 4. The prognosis depends upon the infectious nature of the disease. The subperiosteal or subdural abscesses, the phlebitis of the sinuses, and the septico-pyæmic infections are the natural consequences of osteomyelitis. As for other bones, trephining forms also for the temporal bone the foundation of the surgical treatment of osteomyelitis. GELLÉ.

27. This paper of SIEBENMANN is a reply to the Grunert's attack, a defence against his insinuations, and an amplification of Siebenmann's experience communicated in his former publication, "The radical operation of cholesteatoma." Necrosis and caries of the osseous walls of the middle ear, as concomitants of acute otitides mediæ, form one of the most frequent causes of cholesteatoma. Siebenmann observed among seventeen of his cholesteatoma cases quoted in his first publication, in five, old retracted osseous cicatrices of the mastoid, which were proven to have been due to an acute affection from scarlet fever, diphtheria, etc. Such osseous processes are of quite frequent occurrence from the period when the fully developed cholesteatoma is recognized, but they are rare as concomitants or consecutive phenomena. Siebenmann, therefore, urgently advises preventive measures in this sense, that, wherever in acute osseous affections of the mastoid extensive resections had to be made, the cavity should not be permitted to close without placing cutaneous flaps from the surrounding parts into the osseous opening. This procedure simultaneously accelerates the duration of healing. Siebenmann could directly observe and follow up the excentric, rapid growth of the cholesteatomatous cavity in several of his operated patients. There existed no growing of epidermal papillæ into the healthy osseous tissue, but the abnormally increased physiological process of pneumatization, which Siebenmann had

described in a former paper (*Correspondenzblatt für Schweizer Aerzte*, 1891). With reference to the treatment, at first, insufflation and irrigation with the antrum canula should, as a rule, be tried, before resorting to operation. This procedure leads with consistent, steady application, in a large fraction of cases, to definite recovery; in just as large or still larger percentage, the cavity may thus be dried for weeks and months. Grunert's assertion that the introduction of the antrum canula was impossible in a large number of cases, is in direct opposition to the experience of those who are familiar with the use of the instrument. The conclusion of the paper argues against the assertion that Siebenmann's operative procedures are neither novel nor necessary. He points to the history of Zaufal-Küster's chiselling off the posterior wall of the external meatus, and emphasizes the fact that, in this twisting in of pedunculated flaps, the hemming in of the concha wound, Thiersch's transplantation of the operative canal and sewing of the uncut flaps of the soft parts of the posterior wall of the external meatus to the outer skin had been first used and described by himself. This combination proves, as has been mentioned in his first paper, to be unnecessary in a thin corticalis; in deep-seated small cavities, however, it forms the only means of establishing surely and rapidly a persistent opening. In seven further cases of this kind, operated upon during the first half of the year 1893, Siebenmann's method has also been successful.

AUTO-REVIEW.

28. According to HABERMANN, cholesteatoma is hyperplasia of the epithelium of the external ear, which develops from chronic inflammations and grows into the cavities of the middle ear. With the persistence of inflammation, the hyperplasia continues in the propagated cutis, the superficial epidermic layers of which are continually thrown off, and are gathering in the cavities of the middle ear as onion-like, stratified, lustrous masses.

POLLAK.

29. Among 4 cases of strong young men, in which EITELBERG had extracted the hammer on account of chronic purulent otitis media, the otorrhœa ceased only in 1 case almost entirely within ten days. In the remaining 3 cases it persisted for months. Furthermore, Eitelberg reports favorable results in the sclerotic form of otitis media, which in several cases were not limited to the operated ear, but was evident in the other likewise diseased ear.

30. Several dozen cases of chronic purulent otitis media have been treated by MEYJÈS with excision of membrana tympani, malleus, and incus, or drum-membrane and malleus only, after the ordinary means had been without success. They were mostly pure cases of "attic" disease, in which the hearing, as a rule, was still fairly well preserved, unless the membrana tympani was entirely destroyed and the malleus, much retracted, was fixed by fibrous bands in the tympanic cavity. Scraping of the tympanic cavity, principally of the promontory, stopped the suppuration when the ossicles were absent. Increase of acuteness of hearing and improvement of tinnitus were marked after removal of the firmly attached malleus, with the stapes pushed inward by the likewise attached incus. The passage between the tympanum and the attic being thus improved, otorrhœa ceased much more rapidly. The results of the removal of the malleus in sclerotic cases were much less favorable; the author, however, attained in 2 cases increased sensibility for noises.

AUTO-REVIEW.

31. The seat of predilection for caries was found to be the floor of the tympanic cavity and the aditus ad antrum. The operations were performed according to Panse's method. With reference to the success of Stacke's method, there were, among 43 cases published in this paper, 24 recoveries (= 56 per cent.); 7 cases remained under treatment, 5 withdrew from treatment, 6 were discharged as not cured, and 1case died (not in consequence of the operation). The duration of the required after-treatment varied between $1\frac{1}{2}$ and 11 months; the average duration was $4\frac{1}{4}$ months. Among 57 cases published by Panse, recovery could be verified in 20 cases by later examinations; relapses of suppuration took place in 4 of his first successful cases, in one of which recovery subsequently ensued. Fifty-three of 100 operated cases have thus heretofore been cured altogether. The hearing power, upon the whole, appears after complete recovery to be the same as before the operation.

RUMLER.

32. ROHRER draws the attention to conditions which resemble œdema and glandular swellings in the surroundings of the auricle. He observed "secondary periostitis" in 59 cases of his own practice, viz., "as consequence of inflammation of the external and middle ear or of the mastoid process." Three histories of cases for illustration of these etiological agents and also

of the therapeutic value of warm applications conclude the paper. SIEBENMANN.

33. GRUNERT studied the measurements of temperature in 214 cases from the aural clinic at Halle, in which mastoid operations were to be performed, and investigated whether points of practical importance could be gained from this synopsis. He found, in accordance with former observers, as the most important result, that no inferences could be made from the absence of fever as to the absence of disease of the mastoid process; for in 8 cases of acute suppuration with empyema of the mastoid without caries, there existed fever before the operation in 4 cases only, and, in 20 cases of acute otitis media suppurativa with caries without formation of abscess in the surroundings of the ear, no fever before the operation in 16 cases. A similar relation was found in cases of chronic suppuration. RUMLER.

34. Curetting of adenoid vegetations was followed in a child, aged ten, by violent inflammation of the left ear which, despite early paracentesis, did not attack the mastoid cells, but directly the adjoining cerebral sinus. Six days subsequently to the opening of the mastoid, exposure and opening of sinus, ligation of jugular vein, removal of purulent thrombi from the jugular and lateral sinuses by irrigation from the vein with a solution of 0.75 per cent. of sodium chloride under moderate pressure. Favorable course, no pyæmic phenomena, cure of aural affection. GRUNERT recommends irrigation through the sinus for thorough removal in purulent disintegration of thrombus. It is of interest that the child was seized with additional inflammation of the right ear upon second operation for removal of adenoid vegetations, which necessitated the opening of the mastoid. RUMLER.

35. At Prof. Koehler's department of the Charité were operated: 1. A case of foreign body in the middle ear and cholesteatoma of recent origin. After the right mastoid antrum of a woman had been opened twenty-eight and eleven months previously the posterior wall of the external meatus had to be chiselled off for removal of a jet pearl from the middle ear. The removal was successful. An osseous bridge only was found between the membranous meatus and a firm band of connective tissue, which leads from the old scars of the mastoid down to the bottom of the cavity. The band is continued by a membrane 1 *mm* in thickness, which lines an empty cavity of the size of a hazel-nut.

The membrane reached anteriorily the aditus ad antrum. It is completely removed with the sharp spoon. From the history of the case, KOCH concludes that cholesteatoma in developing can disintegrate bone to a considerable extent. 2. A case of extensive primary ostitis granulosa of the petrous and temporal bones. In the robust patient the lungs were found to be normal, nowhere in the bone caseous places, and no tubercular structures in the granulations. 3 A case of extensive tubercular formation of sequestrum in a consumptive. It is noteworthy that, despite total destruction of the horizontal semicircular canal close to the antrum, no vertigo, disturbances of gait or equilibrium were noticed. 4. Cerebellar abscess. "A case of caries of the middle ear, in the course of which vomiting, persistent constipation, mental disturbances, consisting in weariness and loss of interest, continuous normal temperature exist, forcibly points to the diagnosis of a cerebellar abscess, if these symptoms continue after thorough chiselling of the mastoid. Still, the diagnosis has not been made, since too much stress has been laid upon the simultaneous pregnancy of three months' duration." 5. Cerebellar abscess with sinus thrombosis and basal meningitis. RUMLER.

36. The first case was caused by otitis media suppur. acuta, the second by otitis media suppur. chron. In both cases the cranial cavity, the entire mastoid process, the lower portion of the planum temporale, and the anterior portion of the occiput were extensively opened. Chiselling off the entire mastoid process, the temporal line, the lower portion of the squama, together with the tegmen antri mastoidei down to the dura mater. In exposing the dura mater, thick, yellow pus was discharged from the subdural space. POLLAK.

37. ZAUFAL reports his lecture delivered at Nuremberg on the case of an unusually extensive, extra-dural abscess of the right side in consequence of otitis media sine perforatione of one year's duration. POLLAK.

38. The patient was treated by Koerte in 1891. It is worthy of note, that during the first operation, apart from suppuration of the mastoid cells, an extensive subdural abscess was found, which was extensively exposed by chiselling off the bone. Sixteen days subsequently comparatively good conditions, no rise of temperature, pulse regular, no symptoms of recovery, marked mental depression, and abnormal increase of hunger. A cerebral abscess corresponding to the gyrus parietalis inferior, of the size of a

chicken's egg, was accidentally discovered and opened. SCHEIER assumes that this abscess had developed after the opening of the skull. After the operation the voracious appetite and melancholia disappeared. Rapid recovery took place, so as to enable the patient to leave the hospital with an osseous defect of the size of a German dollar. Recovery has persisted these two years, and the patient is well able to work. RUMLER.

39. Lecture before the German Otological Society, at Frankfort-o-M., is reviewed at another place of these ARCHIVES.

40. JANSEN, from his experience, and principally from a fully reported case of a deep-seated, extra-dural abscess with recovery, arrives at the conclusion: "That in cases with negative result of examination of the mastoid process and antrum, with other indications of a deep-seated focus of suppuration in the temporal bone, it is advisable to think that, apart from a deep-seated cerebral abscess, a deep-seated extra-dural abscess after perforation through the upper or lower vertical simicircular canal may exist, despite an intact dura in the region of the sigmoid sinus. In such cases it may be worth while to attribute increased importance to fistulæ of the medial wall of the antrum, to follow them without fear, or eventually to remove the posterior upper edge of the petrous bone. The opening of the vestibule from the horizontal semicircular canal, and from the medial wall of the antrum respectively, is, as in my case, an event not to be dreaded in such cases of labyrinthine suppuration with meningitic irritation, but is, on the contrary, desirable, and, in suitable cases, even to be established." RUMLER.

41. "The paper is based upon those cases of the material of the R. aural clinic at Berlin, in which (1), the diagnosis was ascertained by autopsy; (2), by operation; (3), one case of recovery was without this confirmation, but with a clinical picture of great distinctness. According to the same principles, the material found in literature within my reach was used but I limited myself to otitic sinus-thrombosis." The number of reported cases is 42. Of the thrombosis of the sinus transversus, 34 cases were observed in 33 patients. The paper is very thorough and treats fully of all pertinent questions, principally with reference to treatment. Its study is, therefore, urgently recommended.

RUMLER.

42. A man, aged forty-seven, of robust health, was seized with violent hemirania; on the following day intense pain in the

right ear, which was followed on the subsequent day by copious discharge of pus from the same ear. Simultaneous appearance of deliria, 40.4° C. on the fourth day. Symptoms of meningitis and broncho-pneumonia. On the sixth day, pain in the right knee, which swelled rapidly, and, on incision, discharged half a glass of yellow pus. Death on the ninth day. At the autopsy, staphylococcus aureus only was found in the suppurations of the ear, meninges, and knee-joint. GELLÉ.

43. Exact description of the clinical and post-mortem examinations. The case was observed in a man, aged thirty, who had suffered in his twelfth year of age a severe injury to the cervical vertebral column, leaving permanent moderate stiffness in the nape of the neck. At the aural clinic at Halle, at first, tuberculous ostitis of the atlanto-occipital joint, was diagnosed and the patient, therefore, placed into Glison's extension sling. The disturbances, however, were thereby considerably increased. The symptoms of a malignant tumor of the base of the skull gradually became more marked; death ensued through paralysis of the tenth. At the autopsy the two uppermost cervical vertebræ exhibited their complete destruction by the tumor—spindle-celled sarcoma and also that of the pars basilaris ossis occipitis and of the sphenoid body. The tumor extends laterally principally toward the right side. The temporal bone was not carefully examined. RUMLER.

44. UCHERMANN delivered before the Medical Society of Christiania at its meeting in February, a lecture on the different mastoid operations, principally Stacke's and reported the results of 61 mastoid operations made at the university clinic during the previous year 1892, among which were 16 Stacke operations, partly primary, partly as after-treatment of Schwartze's operation. The youngest individual (Stacke) was one year old. The results were favorable, no fatal issue. The simple Stacke operation was soon abandoned, since in most cases complications with antrum disease existed. It was found much easier, not to detach the external meatus from the anterior wall; it suffices to detach it from the posterior wall and push it forward with a spatula (Wolff). Chiselling is then done from without inward (Küster, Schwartze), until the antrum and recessus epitympanicus are reached, sparing but the inner, lower half of the anterior wall of the external meatus. A "protector" is not necessary. The cavity is plugged from the external meatus and also from the

autrum and is kept open. Uchermann does not recommend sewing up the wound. UCHERMANN.

NOSE AND NASO-PHARYNX.

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60. SCHEFF, GOTTFRIED, Vienna. New method of internal massage of the mucous membrane in chronic nasal diseases. *Therapeutische Blätter*, 1893, No. 7.

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48. HOVORKA lays down three fundamental forms of the nose: I. Deepened nose (concave); II. Straight nose; III. Curved

nose (convex). The anatomical conditions for these relations of form are caused by the structure of the nasal frame; the different positions of the frontal processes of the upper maxilla, the form of the apertura pyriformis, the shape and position of the nasal bones, are the most determining agents. POLLAK.

49. The patient, a woman, aged twenty-two, presented, apart from an active ulceration of the soft palate, which was destroyed in greater part, complete occlusion of both external orifices, of cartilaginous consistence, and of a thickness of $\frac{1}{32}''$, which was easily removed by the electric trephine. M. TOEPLITZ.

50. NEWCOMB, after explaining the nature of electrolysis, believes that projections, thickenings, and deviations of the nasal septum offer a fair field of success to this method. He then dwells fully upon the French literature of the subject, giving due credit to Moure and Bergonnié. He describes the technique of the operation at length, preferring the bipolar method. The advantages are bloodlessness and lack of reaction and adhesions, whilst painlessness is not always established. Newcomb treated two cases of deviation and bony ridges by electrolysis successfully, one of which, however, was followed by perforation of the septum. He believes that whatever can be done by electrolysis, can be accomplished by other means far more quickly.

M. TOEPLITZ.

51. RICE treated five cases of atrophic rhinitis with the smaller ozone generator of Labbé and Oudin, and three cases in conjunction with Dr. Morton by means of the large apparatus of the Ozone Manufacturing Company, applying ozone from five to eight minutes. The effect varied according to the amount used. Ozone produced smarting irritation and congestion of the mucous membranes for several hours, increased the secretions for eight hours, and lessened the dryness and odor for several days. Permanency of the results could not be obtained on account of the short duration of the trials. Rice applies ozone also locally on cotton in form of therapol (sweet oil and 8.75 volume per cent. of ozone). M. TOEPLITZ.

52. HAYNES uses ozone in the form of therapol, applying it by cotton swabs to the pharynx and injecting it by small syringes in quantities of from 15 to 20 minims into each nostril. In addition he used chlorate of potash with iron and calomel fumigations. He reports seven recoveries. M. TOEPLITZ.

53. BREWER has observed the hæmostatic value of peroxide

of hydrogen in six cases, two of which are fully reported. The arrest of hemorrhage may have been also due to the lowering of the blood pressure. He explains the hæmostatic action of the drug from its disintegration of the red corpuscles and the resulting occlusion of the small vessels by their detritus, and also from the degeneration of the epithelial cells. M. TOEPLITZ.

54. The sequestrum, the rostrum of the vomer, was removed by forceps from the septum of a patient who had suffered from a bad odor for two years. The most delicate test for dead bone in the nose is, in MYLES's opinion, the cotton-wrapped probe.

M. TOEPLITZ.

55. EULENSTEIN, after reviewing the views and experience of other authors on rhinitis fibrinosa, gives such a case of his own observation in which plugging with iodoformed gauze proved so successful as to recommend this method for treatment. The paper concludes by summing up that (1) the appearance of pseudo-membranes designated as rhinitis fibrinosa is not an independent disease produced by a specific microbe, but a picture of disease due to different effects, and that (2) fibrinous exudations following therapeutic cauterizations develop by the cauterization alone, without the additional action of a definite micro-organism.

NOLTENIUS.

56. A brief synopsis of the causes, consequences, and treatment of impermeability of the nose. POLLAK.

57. ROE arrives, among others, at the following conclusions: (1) epilepsy is a frequent result of peripheral irritation; (2) the susceptibility to peripheral irritation varies greatly in different persons; (3) the nose is frequently the seat of sufficient irritation to excite a variety of reflex manifestations, as central phenomena, in the form of epileptic convulsions or as peripheral ones of an entirely different character; (4) The nose exhibits well-defined sensitive areas, independent of the neurotic condition.

M. TOEPLITZ.

58. BRESGEN admonishes to lay more stress upon the fact that headache is a very frequent symptom of nasal and pharyngeal affections. The cause of nasal headache is a certain degree of swelling of the mucous membrane (which does not necessarily imply an obstruction of the air passage) in conjunction with a regularly or irregularly (by anomalies of septum) constructed narrow nose, principally in the region of the middle turbinate; furthermore, in suppurations, apart from swelling of mucous

membrane, retention of secretions, and denuded and inflamed places of bone (principally in the middle nasal meatus). With reference to the diagnosis, isolated places of the more or less swollen mucous membrane are, in the painless period, markedly sensitive to the touch of the probe; if headache is present, the swelling is more extensive and the region of the "pressure points" markedly red and sensitive. Bresgen holds, in the pharynx, principally the hypertrophy and suppurations of the pharyngeal tonsil responsible. The headache is here due partly to the never-missing participation of the nose, partly to the formation of crusts in the naso-pharynx. From the place of sensation of the headache, one can never draw an inference as to disease of a distinct place of the nose and pharynx, this being ascertained only by accurate examination, principally with the probe. Finally, Bresgen quotes those cases in which certain excitations (mental, sexual) cause swelling of the nasal mucous membrane, and thus also headache. He concludes with remarks on the treatment and admonishes, in every case in which no other cause of headache can be detected, to examine the nose and pharynx.

59. SCHEINMANN elaborately discusses the different nasal affections, causing headache and demands "an examination of the nose for local causes in habitual cephalagia of unknown origin."

RUMLER.

60. Upon the handle of a dentist's drilling engine Power's hammer armed with a nasal probe is placed. By the movements of the engine, successive, rapid strokes of the hammer occur, the intensity of which is, by an arrangement, increased or lowered according to requirement, and the probe is thus executing vibratory movements. The vibrations are uniform and do not require dexterity nor practice for their execution. POLLAK.

61. FREUDENTHAL devises for nasal massage an electric vibrator, consisting of a probe which is placed between two magnets and moved back and forward by the interruption of current, running through attached wire coils and metal plates. The probe makes almost 8000 vibrations per minute. Whilst massage is contra-indicated in acute cases, hypertrophies as well as atrophies of the nose and pharynx are claimed to have been cured and the duration of attacks of hay fever considerably shortened by this method. Freudenthal is not as optimistic as the originators of nasal massage (Braun, Laker), but he does not condemn it as Chiari does. M. TOEPLITZ.

62. HERZOG tabulates eighty cases from literature including ten fully reported cases, nine of which were taken from SEIFERT'S clinic at Würzburg and one from his own private practice. He arrives at the following conclusions: Tuberculosis of the nasal mucous membrane is comparatively rare, but not so rare as formerly supposed. It is generally secondary, but also primary (in 25 per cent.). It occurs in form of ulcerations, tumors (generally in primary cases), and a combination of both. It occurs at any age, preferably at the ages between ten and forty years. It is most frequently located upon the cartilaginous septum. It takes a very chronic course and relapses are the rule even after surgical interference. We highly recommend the careful perusal of the paper, which, in fact, forms a clear and exhaustive monograph of the subject. M. TOEPLITZ.

63. The first case exhibited in a lady, aged twenty-three, a chronic ulceration of the septum and lower turbinate with a vascular hypertrophy of the latter. The ulcer was long and narrow, extending over nearly half the length of the septum. In the second case, occurring in a lady, aged seventy-one, there existed an infiltration and enlargement of both sides of the septum; after the removal of which a perforation persisted. The microscopical examination of the removed portions of this case revealed the structure to be similar to that of miliary tubercle.

M. TOEPLITZ.

64. After exhausting all remedies KEIPER used a spray of atropine (gr. ii. to ℥ i.) with great success. M. TOEPLITZ.

65. MULHALL observed six cases of rhinitis œdematosa, acute and chronic, of intermittent character, with scanty serous discharge and swellings, migratory over the nasal cavities. The œdema was not affected by cocaine and was, in two cases, coincident with bronchial asthma. Two acute cases also presented icterus; in three cases existed biliousness, after the cure of which the œdema and asthma disappeared. Mulhall, therefore, calls it peptic œdema. Local treatment of the nose, especially in acute cases, should be avoided. M. TOEPLITZ.

66. A boy, aged five, with croupous tendency, developed after amygdalitis an occlusion of the left nostril produced by a whitish membrane, which filled the entire nostril and was withdrawn only under bleeding, but was easily detached each time after three returns by warm solutions of bicarbonate of soda. The affection, which was not attended by fever, may have been due to previous

irrigations of the nose with "dirty" water by a syringe. DUNN highly recommends bicarbonate of sodium as a cleanser even in acute coryza. M. TOEPLITZ.

67. The patient, an anæmic girl, aged sixteen, presented a small pedunculated growth at the junction of the skin and the mucous membrane of the septum of the right nostril, with hemorrhage and thick discharge from, and occlusion of, the same nostril. The soft growth was removed by snare, and did not recur. The microscopical diagnosis was cavernous angioma. This case is a very rare one. M. TOEPLITZ.

68. A girl, aged eighteen, was seized with fever and headache. The perichronditis had to be treated with incisions of the mucous membrane and curetting of the carious places. There existed no sign of tuberculosis or syphilis. RUMLER.

69. In this case the affection appeared in a diabetic patient aged sixty. It sufficed to make an incision on one side. RUMLER.

70. In order to ascertain the form and percentage of deformities the nasal septum of the new-born, AUTON examined systematically the nasal cavities in 56 autopsies of children. He found in 9 (16.07 per cent.) deformities, viz.: pure deviation, one case; with formation of spur associated with deviation of septum—eight cases. RUMLER.

71. MOURE attained in ozæna excellent results by daily insufflations of solutions of nitrate of silver of from 10 to 25 per cent. or of chloride of zinc of from 2 to 10 per cent. The treatment should be abandoned in too vehement reaction or too intense epistaxis. GELLÉ.

72. In the lecture delivered at the sixty-fifth meeting of German naturalists GRÜNWALD recently emphasizes, that the question of the cause of the formation of offensive crusts and that of the origin of secretions have to be separately considered, in order to be cleared up. A series of histories of cases furnishes further material for illustration of these points: three cases, in which the excellent result of treatment proved that the complex of symptoms was due to disease of accessory cavities (one recovery); furthermore, four cases, in which the improvement produced by the removal of adenoid vegetations, or of hypertrophied tonsils, respectively, furnish the proof for the causative importance of adenoid tissue in the pharynx for the complex of symptoms—cases which may be suitable to throw light on the spontaneous

cure of "ozæna." With reference to the atrophy, Grünwald emphasizes the necessity of distinguishing between atrophy of the mucous membrane and atrophy, or rather aplasia, of the bone, for the abnormal thinness of the osseous frame is not always, even rarely, of pathological origin. He denies the correctness of the conclusions which Hopmann derives from his measurements, which are not in accordance with his own. He considers, in accordance with Walb, the atrophy of the mucous membrane as secondary, caused by the pressure of the crusts. Grünwald then precisely defines the practical results arrived at by actual observation, referring to his former thesis, and he concludes, that "a causative diagnosis can in this disease be made only by causative treatment." MÜLLER.

73. DUNN reports a cured case of atrophic rhinitis, which had lasted ten years. He considers atrophic rhinitis as the result of chronic inflammation, originally purulent, of the nasal mucous membrane, the result of untreated purulent rhinitis of children. Purulent rhinitis is caused by infection. The cure of atrophic rhinitis is effected by the disappearance of inflammation and the cessation of formation of connective tissue. The interior of the nose is like a scar, in which the epithelium and underlying stratum has somewhat regenerated, of course, with destroyed olfaction and erectile tissue, and widening of the nasal spaces. Treatment consists of thorough cleansing, application of nitrate of silver, with subsequent neutralization, and of sublimate (1:1200).

M. TOEPLITZ.

74. The enormous growth, which filled out the nasal and pharyngeal cavities, had developed in a child, aged four and three-quarters, and had speedily returned after the first thorough removal by the snare. The second operation, performed according to Billroth's method of resection of the upper jaw, cured the child for four months. Death from relapse in the pharynx and the lymphatic glands of the neck. M. TOEPLITZ.

75. Of the four cases of epistaxis due to influenza reported by DE ROALDES, one occurred during the attack and the other three during its decline. All cases presented stenosis of the bleeding nostril, which, combined with grippal diathesis, caused the hemorrhage. Roaldes justly condemns posterior plugging on account of the severe aural complications, and advocates antero-posterior packing by long strips of iodoform gauze, after preliminary disinfection and cocainization. A complete bibliography is appended to the ably written paper. M. TOEPLITZ.

76. With reference to Grünwald's book, *The Study of Nasal Suppurations*, etc., Schuster, in opposition to Grünwald, pleads that specific nasal suppurations should be placed along those developed from other causes, since specific suppurations are not essentially distinguished from others. Schuster, at the same time, points out "that for many years he has also advocated the frequent application of the nasal probe, as Grünwald now does." Some histories of cases serve as illustrations. NOLTENIUS.

77. MAJOR has formerly found the antrum thirteen times diseased among 189 cases of myoxmatous nasal polypi, and recently, among eleven cases of antral disease, seven with nasal polypi. He usually operates from the alveoli with drills, $\frac{5}{32}$- and $\frac{3}{16}$-inch thick, in slightly oblique direction. A gold drainage tube is soldered to its base, a gold sheet, beaten out of metal according to a model taken from a plaster-of-Paris cast. The base is secured to the jaw either by a pair of arms if one tooth is wanting, or by a suction plate if several teeth are missing, or by false teeth when such are worn. The tube, through which injections of boric acid or alkaline antiseptic solutions are made, is closed by a rubber plug. M. TOEPLITZ.

78. WOLFENSTEIN reports his case on account of the rarity of acute empyemata and its nasal origin. He analyzes trans-illumination as to its relative value for diagnosis, and recommends mild measures (alkaline antiseptic washes) in acute cases before resorting to surgical procedures. M. TOEPLITZ.

79. The differential diagnosis between diseases of the antrum, frontal sinus, and anterior ethmoid cells may always be established by inspection, irrigation, and transillumination. Peroxide of hydrogen and exploratory puncture are unnecessary. The frontal sinus is enlarged from the infundibulum by the curette, also the anterior ethmoid cells with clipper and curette, and both are then irrigated. The antrum is temporarily opened by CALDWELL from the canine fossa, through which the cavity is thorougly cleansed, but the after-treatment is conducted from a counter-opening into the lower nasal meatus and the primary opening allowed to be closed. The posterior ethmoidal and the sphenoid cells are treated from their natural opening at the sphenoid, and are reached with considerable difficulty from the naso-pharynx by a hook-shaped knife, M. TOEPLITZ.

80. A soldier, aged twenty-one, was, in the course of coryza, affected with fever and cephalalgia, œdema at the root of the nose and the left upper eyelid. Trephining of the frontal sinus with

discharge of pus. Death ensued, nevertheless, during coma, with aphasia and monoplegia of the right arm. At the autopsy, a cerebral abscess was found in the second and third left frontal convolution. GELLÉ.

81. The complete occlusion, found in the right nostril of the female patient aged seventeen, was after removal of an ecchondrosis of the anterior part of the septum of that side, drilled through with the electric trephine at two places, and the respiration thus freely restored. M. TOEPLITZ.

82. WAGNER reports four cases of salivary calculus. The first and third cases were calculi of Bartholin's duct; the second was also a small one of Wharton's duct; the fourth calculus, the largest on record, weighed 93 grains, and was removed by Dr. James of London from the duct of Stensen. M. TOEPLITZ.

83. MEYJES uses, for removal of adenoid vegetations, Gottstein's instrument, suitably modified by Hicquet.

84. Adenoid hypertrophy, if left to itself, does not subside, but leaves (1) a degree of hypertrophy, (2) so-called Tornwaldt's disease, or (3) an atrophic condition of the vault of the pharynx. All these conditions may have not only local but also far-reaching effects upon other organs. M. TOEPLITZ.

85. NEWCOMB operated on an anæmic boy of strumous appearance, without history of hæmophilia, for adenoid vegetations, under ether, in supine position, and permitted the patient to go home after two hours. When called for after sixteen hours, he found the patient in a dying state. Death was due to exhaustion from slowly progressing hemorrhage. All diathetic conditions except the strumous had been excluded before operation. An analysis of all cases reported appears unsatisfactory as to tabulation and conclusions. The position and the instruments used had no bearing upon the hemorrhage. Newcomb advises the greatest possible care, even in the simplest surgical procedures.
M. TOEPLITZ.

86. The growth occurred in a female aged sixty, and was of about the size of a pullet's egg, two inches long and three quarters thick. It was attached by a narrow pedicle to the right inferior turbinated bone. A year after removal, another polypus hanging over the velum, almost touching the base of the tongue, presented itself. M. TOEPLITZ.

87. The tumor, twice as large as a partridge's egg, occurred in a man aged forty-four, and was inserted into the roof of the

pharynx. It was removed in nine operations with the cautery knife and subsequent applications of persulphate of iron to its base; it shrank considerably. The growth was a round-celled sarcoma.

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88. In nearly all cases of pharyngeal catarrh, the author found that the cause of disturbances of speech should be looked for in: (*a*) extensive development of the so-called lateral bands, situated on the arcus palato-pharyngeus, (*b*) enlarged tonsils, principally with intense development of the follicles, (*c*) increased follicles of the lingual base. Cauterization with chromic acid led to complete recovery in the cases *a* and *c*; incisions into the tonsils, according to Moritz Schmidt, in the cases *b*, if removal of the enlarged portion by tonsillotomy is impossible. Insufflations of watery solutions of ichthyol of ½ %, applied by the patient every two hours, serve to promote rapid recovery. In many cases of so-called neurosis laryngis, the author asserts the presence of the above-mentioned abnormities. In real neurotic cases the patients complain, as a rule, of disturbances of deglutition, not of speech.

AUTO-REVIEW.

89. A robust man, aged thirty-five, experiences in eating rye bread intense pain in the throat, with a simultaneous beginning of an arterial hemorrhage of long duration. Cause—a bristle, which was present in the bread, had pierced tonsil and uvula. The hemorrhage ceased after extraction of the bristle.

NOLTENIUS.

90. The affection is most frequently located outside of the tonsil. Scarification of the tonsil only aggravates the condition. Early incision for the evacuation of pus, in most cases, gives immediate relief. The incision should be made at a point about midway between the base of the uvula and the upper alveolar process of the affected side. The danger of wounding the vessels of the neighborhood is not so great as it was anticipated by Holden, Gray, Cruveilhier, Quain, Leidy, and Tillaux, who place the vessels very close to the tonsil; on the other hand, according to Delavan and Zuckerkandl the tonsil is separated by the anterior part of the pharyngo-maxillary interspace from the internal carotid, which is behind it and 1.5 *cm* laterally from it. The stylo-glossus and stylo-pharyngeus muscles divide the pharyngo-maxillary space into an anterior and posterior chamber. If the soft palate is swollen, an incision of even 2 *cm* could not reach the carotids. In the four cases of Chassaignac, Duke,

Murphy, and Stanley of excessive hemorrhage after incision into or about the tonsil, injury to the wall of the carotid by the knife was proved not to have been the cause of the bleeding. In Duke's and Murphy's cases the internal carotid was eroded or ruptured by pus and the blood had freely escaped from the vessel, but was pent up in the pharyngo-maxillary space. BRANNAN collected 20 cases of erosion of large arteries due to faucial phlegmon, among which were 18 spontaneous openings. Four out of 7 ligations of the common carotid resulted in recovery. All but 1 of the remaining 13 cases died without ligation. Among 8 autopsies perforation of the internal carotid was found in 5, of the internal maxillary in 1, of a branch of the external carotid in 1 and of the tonsillar artery in 1 case. The erosion of the artery may be due to some additional general dyscrasia or an impaired state of the wall from previous inflammations, or perhaps to the septic character of the pus combined with pressure. The great majority of the patients were men. At the conclusion of this most valuable paper, Brannan advises an incision at the earliest possible moment through the soft palate (unless the pus points elsewhere), and, in great tension, even without formation of pus. There is no danger of wounding large vessels. In deep-seated abscesses, however, erosion of arteries may take place and the arterial hemorrhage should be immediately checked by pressure and subsequent ligation. M. TOEPLITZ.

91. The remarkable features of the case, occurring in a girl, aged sixteen, consisted in the first appearance of multiple tumors of the soft palate in 1889, which was reported by Lefferts in the *Transactions of the Amer. Laryng. Society* of that year as multiple papillomata, and in their subsequent transformation into a malignant growth. Sixteen months after the removal with flat scissors, the recurring tumors were removed by SIMPSON with the galvanocautery knife and lactic acid. They rapidly returned and now lost their benign appearance, adding infiltration of the soft palate, which when removed by the knife proved to be sarcomatous. Two months later more extensive recurrence took place, and death ensued two years and a quarter after the first appearance of the apparently benign growth. The cautery and lactic acid may have favored the change into malignancy. M. TOEPLITZ.

92. DUNN gives a full and elaborate report of a case of sarcoma of the right tonsil which he had observed for over ten months in a lady aged fifty. The sarcoma gradually travelled from the right ulcerated

tonsil through the pillars, into the soft palate and uvula on to the base of the tongue, into and beneath the aponeurosis of the pharynx, into the cheek, in the lower jaw and gums. The lymphatics were not permanently swollen during the first six months. The growth presented in all affected portions a cheese-like consistence with tendency to ulceration. It did not bleed, even after extensive removal. There existed neither marked salivation nor marked pain. Complete removal was not attempted and the treatment consisted of antiseptic washes and partial removal.

M. TOEPLITZ.

93. The two cases of PARK occurred in males, aged fifty-eight and thirty-one respectively. Both cases were operated on according to Mikulicz's method, but without resection of a portion of the lower jaw, which was divided and reunited by metallic sutures, and without division of the hypoglossal nerve. The first patient has thus far remained well for two years and a half after the operation. The second patient, whose other (right) tonsil was involved, died four days after operation. The tumors of both patients were round-celled sarcomata. M. TOEPLITZ.

NERVOUS APPARATUS.

94. HERDMANN, J. Clinical observations as to the function of the right temporo-sphenoidal lobe. *Journal of Nervous and Mental Diseases*, 1893, xviii., p. 612.

95. LÉRIEUX, P. A case of pure word deafness. *Rev. de méd.*, Aug. 10, 1893, p. 733.

94. In a case of loss of hearing and taste, apart from other symptoms, there was found a hemorrhagic focus in the anterior portions of the right temporal lobe. ASHER.

95. *Gradual* development of word-deafness in a woman aged fifty-one, without word-blindness, with motor aphasia or agraphia. Hearing in the left ear entirely normal; in the right, in consequence of chron. otit. media, considerably changed. Repeated assurance of the patient, that she hears, but does not understand the words; there existed also musical amnesia. Whistling and bird-song could be distinguished with difficulty from the human voice. Things of every day's occurrence, when written, are understood. Visual impressions normal; memory and intelligence undisturbed. Gradual increase of the phenomena. Complete word-deafness after a slight apoplectic attack. The words are now, in writing

from dictation, incoherent and unintelligible. She can read with loud voice without understanding the context. Spontaneous speech and writing more incorrect than formerly. Cessation of paraphasia. Probable diagnosis: Injury to the subcortical acoustic paths.

Moos.

REPORT ON THE ANNUAL MEETING OF THE BRITISH MEDICAL ASSOCIATION, HELD AT BRISTOL ON AUGUST 1ST, 2D, AND 3D.

SECTION OF LARYNGOLOGY AND OTOLOGY.

By Mr. HARSANT, of Bristol, Secretary.

Dr. McBride, of Edinburgh, presided, and made a few observations on recent progress in otology, alluding especially to the surgical treatment of suppurative ear disease.

A discussion on the prognosis of chronic non-suppurative otitis media with imperforate membrane was opened by Mr. G. Field, of London. He included under this designation the acute and chronic catarrhs of the Eustachian tube, as well as chronic catarrhs of the middle ear. Among *unfavorable* conditions he would include a long duration of the symptoms, mentioning six months to one year as the limit within which we can reasonably hope to restore perfect hearing; a general constitutional cause rather than a local one as the origin of the malady; also cases following exanthemata he considered unfavorable, as well as cases with an hereditary predisposition. Occupations exposing the subject to the influence of the weather, and a slow and insidious commencement, were among other unfavorable conditions, while the converse conditions were *favorable.* He considered prognosis most favorable in children and young adults, in whom the cause is plainly attributable to local and removable obstruction, naso-pharyngeal or faucial abnormalities, or to simple mucous obstruction of the Eustachian tubes. The prognosis is unfavorable where, with much deafness, there is no improvement whatever after forcible catheterism, dilatation of the Eustachian tube, removal of secretions, or the intra-tympanic injection of solvents. The prognosis is absolutely bad where the symptoms point to primary sclerosis, and

worst of all where the tuning-fork tests point to serious labyrinthine disturbance.

Dr. THOMAS BARR, of Glasgow, read a paper on the same subject. Among the varieties of the affection he considered the painless exudative inflammations the most hopeful, while the painful exudative forms were not so hopeful. The non-exudative varieties he considered much less favorable as regards prognosis. The more marked the objective changes found in the ear, the more favorable are the prospects of improvement.

The absence of improvement after a single act of inflation must be looked upon as an unfavorable omen. He did not consider that accompanying labyrinthine disease always meant an unfavorable prognosis, but the presence of the phenomenon of hearing better in a noise, which indicates stiffening of the ossicles, must be regarded as unfavorable in a prognostic point of view, although it does not exclude all chance of improvement.

In the discussion which followed the reading of these papers Dr. DUNDAS GRANT said he divided cases of non-suppurative catarrh into three classes :

1. Those in which there is evidence of Eustachian obstruction and improvement on inflation, in which the prognosis is relatively favorable.

2. Those in which there is no evidence of Eustachian obstruction and no improvement on inflation, in which the prognosis is unfavorable.

3. Those in which there is evidence of Eustachian obstruction, but little or no improvement on inflation. In these the prognosis is intermediate between the two others.

He considered that the element of sex had something to do with prognosis. The most intractable cases were met with in young women. He had found anæsthesia of the membrani tympani a bad omen, indicating a tropho-neurosis.

Mr. LENNOX BROWNE was pleased to observe that the word "catarrh" was omitted from the subject title, and regretted to find it introduced so frequently into the opening remarks. In his opinion the one great indication in the treatment of middle-ear deafness was to remove all nasal obstruction, and if this were done he considered the prognosis favorable, but all methods of treatment by inflation were worse than useless until the patency of the nasal passages was established.

Dr. KERR LOVE, of Glasgow, considered the chief difficulty to

be to distinguish between the various forms described by Dr. Barr as exudative, interstitial, etc. He had found that if inflation for a period of three weeks produced no improvement, the prognosis was generally unfavorable.

Dr. WALTER DOWNIE alluded to the failure of pilocarpine in these cases, and spoke of the importance of establishing free nasal breathing.

Dr. PERMEWAN thought that inflation should be persevered with for six months before forming a hopeless prognosis. He did not think it probable that a long-continued inflation was likely to do harm.

Dr. WILLIAM HILL considered the presence of soft obstructions in the nose and naso-pharynx influenced prognosis to the extent that in advising operative treatment we were justified in giving the patient more hope of relief in this condition than in the case of hard, rigid obstructions, such as spurs or deflections of the septum. He advocated the use of the Eustachian bougie in bad cases.

Dr. MCKENZIE JOHNSTON, of Edinburgh, considered the prognosis to be mostly bad in the very chronic cases, especially in those cases of dry catarrh met with in young females. The prognosis was most favorable in obstructive cases.

Dr. H. KNAPP, of New York (who was called upon by the President), thought the prognosis depended on conditions which the patient presented when first seen by the physician. Cases which were caused by adenoid growths or nasal disease could be benefited by the removal of these causes even long after the deafness had been set up. He alluded to two recent methods of treatment, both depending upon the surgical principle of treating stiff joints by forcible movements. The first was the *electric vibrophone*, which, during the last year, had been much spoken of in America, and the second was the *pressure probe* of Professor Lucae, of Berlin. He gave a description of the latter, which he had lately seen applied by Professor Lucae in two cases, with very great improvement of the hearing power.

Dr. PEGLER spoke of the benefit derived from using a self-inflator, and considered that the bad results sometimes observed from over-pressure were avoided by the use of this instrument. He had found encouraging results from the use of solutions of menthol in paroleine.

Dr. MILLIGAN, of Manchester, drew an important distinction

between cases where catarrhal and exudative changes predominated, and those in which adhesive products were formed as the result of the pathological process. The latter were the more unfavorable as regards prognosis. He had formulated for his own guidance the following hypothesis: "The amount of hearing which can be estimated to that in any given case after successfully inflating the middle ear, can generally be maintained provided treatment be efficiently carried out."

THE PRESIDENT summed up the discussion in a few well chosen words.

Dr. JAMES KERR LOVE, of Glasgow, read a paper on "Deaf-Mutism as a Clinical Study," which was discussed by Dr. Dundas Grant, Dr. Bennett, Dr. Warden, Mr. Harsant, and Dr. McKenzie Johnston.

Dr. THOMAS BARR, of Glasgow, read a paper on "Excision of the Malleus as a Preliminary Operation to Opening the Antrum in Cases of Suppuration from the Attic and Antrum." Some observations on this subject were made by Dr. Knapp and Dr. Milligan.

Dr. DUNDAS GRANT read a paper "On a Better Appreciation of Rinné's Test, the Aëro-Osseal Difference."

Dr. WALTER DOWNIE read a paper "On the Care of the Ear during the Exanthemata," which was discussed by Dr. McKenzie Johnston and Dr. Barr.

Papers by Dr. MILLIGAN on "Excision of the Ossicula Auditus in Chronic Suppurative Otitis Media," and by Mr. HARSANT, of Bristol, on "The Hearing Power of Deaf-Mutes," were not read owing to want of time.

A cordial vote of thanks to Dr. McBride, for the able and impartial way in which he had conducted the proceedings, closed a very successful meeting.

Book Reviews.

Thrombosis of the Lateral Sinus Due to Purulent Otitis Media and its Operative Treatment. By ARTHUR AF FORSELLES, Assistant Surgeon at the Surgical Clinic at Helsingfors. Knopio, 1893. Published by C. W. Backmann. 125 pages, with numerous tables. Reviewed by S. Moos, Heidelberg. Review translated by M. TOEPLITZ, New York.

Ever since Zaufal first proposed and proceeded to operate thrombosis of the lateral sinus, this operation has been frequently and successfully performed. This otitic complication has become of so much greater interest, as, despite the great number of the heretofore published cases, and despite the excellent paper of Jansen (*Arch. f. Ohrenheilk.*, vol. xxxv.), Hessler (Schwartze's *Handbook*, ii.), A. Lane ("The Symptoms and Treatment of Septic Infection of the Lateral Sinus as Illustrated by Ten Cases," *Brit. Med. Journ.*, 1893, September 3d, p. 561), O. Koerner ("The Otitic Diseases of the Cerebrum," etc., Frankfort on the Main, 1893), and Wm. Macewen, the assertion made by Griesinger thirty years ago still holds good: "The diagnosis of thrombosis of the lateral sinus remains, at any rate, but a diagnosis of probability." The aural specialist will therefore welcome a monograph which elaborately and fully treats of the study of thrombosis of the lateral sinus according to personal (also operative) and general experience. All pertinent facts are discussed with as much exactness as reserve, which a subject, in which many important points are still doubtful or uncertain, surely requires.

The author has collated from literature 137 suitable cases,[1] and added 6 of his own from the surgical clinic at Helsing-

[1] The author could not as yet use Lane's, Jansen's, Koerner's, and Macewen's publications.

fors. Among the clinical histories the operated cases are also communicated.

The first part contains 15 autopsies: Historical, anatomical synopsis, thrombosis in general, classification of thromboses of the cerebral sinuses, course and complications, diagnosis and differential diagnosis, prognosis, treatment, determination of location of lateral sinus, operative procedure for opening and cleaning the lateral sinus and the vena jugularis interna, critical synopsis of the operative results and bibliography of papers quoted in the first part. The second part contains the histories of cases which are arranged according to the following points of view:

1. Cases of thrombosis of the lateral sinus without meningitis and cerebral abscess.
2. Cases with meningitis.
3. Cases with cerebral abscess.
4. Cases with meningitis and cerebral abscess.
5. Cases without positive statement of complication.
6. Cases treated by opening of lateral sinus.

The historical synopsis begins with the first observation, Abercrombie's (1818), and ends at the latest observations and operative cases, which are judged with agreeable impartiality (Zaufal, Horsley, Lane, Ballance, etc.). The anatomical views are principally derived from Gegenbaur and Henle, Klein and Zuckerkandl.

The pathogenesis of thrombosis contains, in general, all prevalent theories and experiments (from Virchow up to date) on its development, the termination of thrombi, and their classification. In the chapter on pathological anatomy the author discusses the changes in the ear and petrous bone, the relation of the sinus transversus, the condition of the thrombus, its extent to the lateral sinus only, to the large vessels on the same and the other side (with figures), and a case (XIII.) of thrombosis of the sinus lateralis, petrosus superior, longitudinalis, and confluens, the condition of the thrombus in the cervical vessels, the lateral cervical abscesses, their perforation, the burrowing suppuration, the complication with pachymeningitis externa (in most cases), and with intradural abscess (in 36 cases). One half of the cases were without complication; with meningitis and cerebral abscess, 67; without both, 27; without meningitis with cerebral abscess, 13; with both, 15.

Table II. presents the extent of the exudation of the pia, Table

III. the location of the cerebral abscess, Table IV. the extent of the exudation of the pia and location of the cerebral abscess, Table V. the pulmonary affection in non-operated cases, Table VI. the metastases obtained.

The sixth *part* on *etiology* is historically treated : from Avicenna up to the bacteriological period. In two cases the author, in accordance with the reviewer, could *positively* (culture) furnish the proof that the infection was caused by the *streptococcus pyogenes.* The author then discusses the effect of the micro-organisms, their paths of infection, principally according to the observation of others. With reference to the paths of infection, the author then discusses principally : caries of the petrous bone, empyema, cholesteatoma and sclerosis of the mastoid process, the thrombosis of the small veins (emissaries), pachymeningitis externa, otorrhœa in consequence of different diseases, principally infectious ones, acute and chronic otorrhœa, the acute being in the author's statistics represented only in 15 per cent. of the cases (in Hessler's statistics in 26 per cent.) ; the briefest period was 4 and 6 days, in more than 70 per cent. of the chronic cases 5 years and more ; according to the author and Robin, the greatest percentage belongs to cases of from 5 to 10 years' duration. The frequency of thrombosis of the lateral sinus increases with *age ;* maximum between twenty-one and thirty years ; the *male sex* preponderates. In the *female sex* meningitis is a rare complication.

The *great* difference between the *right* and *left* side, as it was found by Robin and Koerner, could not be confirmed by the author, but his difference (7.8 more on the right side) is greater than Hessler's (4 per cent.). Statistically it is of interest, that the larger number of thromboses occurs on the right side in the male ; according to Robin, however, in the female on the left side.

Among the predisposing diseases, the author found in seven cases tuberculosis, in one case severe palatal syphilis, which apart from the smaller power of resistance, act in consequence of occlusion of the Eustachian tube by impeded efflux of secretions ; local predisposition is effected by imperforate membrana tympani, high seat of perforation (Shrapnell's membrane) ; furthermore, colds, trauma, operative interference (in 4 cases operation of polypi !), insufficient or inadequate treatment.

In the seventh part the author fully dwells from the pathologico-anatomical standpoint upon the symptomatology of the thrombosis of the lateral sinus and its complications ; upon which the reviewer

need not dwell. "It cannot be denied, that sinus thrombosis, as supposed by Lebert, has been in several cases the connecting link between the otitis media and the cerebral abscess." The reviewer has, during the last year, observed a case of double formation of cerebral abscess; both were successfully operated by emptying the abscess, and later on, nevertheless, fatal issue occurred—the older abscess, according to the autopsy, must be considered as caused by reversed transportation in consequence of a latent thrombosis of the lateral sinus of long existence.

The thrombosis of the lateral sinus may develop with or without a predromal stage of pain. The author found acute increase of pain in 42 of his cases. The disease may, however, suddenly appear without prodromi.

The *fever*, illustrated by fever curves, is carefully discussed. The daily differences are the largest in the uncomplicated form (in meningitic complication mostly but 1°; abscess has no influence!) 4–5° Réaumur. The reviewer has observed a case with 5.4°. In 84 of the observed cases, chills are positively ascertained. In Case 15 only, it is distinctly mentioned, that the affection ran its course *without any chill.* I have observed a striking case of this kind and was induced on account of the absence of fever and for especial clinical reasons, as proved by the autopsy, to make a wrong diagnosis (*cp.* Germ. edition, vol. xxv., p. 212). Very frequently, according to Lane (*l. c.*), even all symptoms are missing until the time for an operation has passed.

From a tabulated synopsis it results, that the chills appear most frequently during the first days[1]; in some cases, however, not until the second or third week. By comparing his tables on the extent of the thrombosis and the chills, the author found that, in most cases in which the thrombosis extended to the jugular vein, chills or an unusually rapid course of the disease are noted. The author believes that extent of thrombosis and intensity of infection are in casual connection.[2] "If the thrombus is but partly in suppuration or putrefaction, and it occludes centrally the sinus or the jugular completely, the infection of the circulatory path is mostly entirely missing." Koerner, *l. c.*, p. 53—REV.

Headache was unilateral in 21 cases, in 16 cases in the forehead, in 3 cases upon the vertex, and 72 cases diffuse.

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[1] In 4 cases only it appeared in the second week, and in 2 other cases still later.

[2] According to these observations, Lane's opposite view, that the clinical symptoms of septic infection appear the more severe, the less the thrombus is extending, becomes untenable.—REV.

Vomiting is an initial symptom; it existed in uncomplicated cases 15 times (25 per cent.), in those complicated with meningitis 10 times (28 per cent.), in those complicated with cerebral abscess 4 times (30.7 per cent.), and in those complicated with the two latter affections 4 times (28.5 per cent.).

Vertigo is also an initial symptom, in 4 cases only it was a late symptom, which is markedly rare in cerebral abscess. It appeared in the uncomplicated cases in 13.3 per cent., in the cases with meningitis in 30.8 per cent., in those with cerebral abscess in 7.6 per cent., and in those complicated with the two latter affections in 35.7 per cent.

No symptom in uncomplicated thrombosis of the lateral sinus is so varying as the *condition of the sensorium;* there are found all transitory states from its entire freedom to marked furibund deliria, the latter in 26.7 per cent., in those complicated with meningitis in 42.3 per cent.

With reference to *œdema of the mastoid region* (Griesinger), the author's statistics result in finding its occurrence 49 times, with thrombosis of the emissary *post mortem* in 15 cases. The author considers this *symptom*, which may occur from the beginning or during the second week, as *uncertain*, because œdema of the mastoid cells, which is noted down 66 times in his entire material, may also produce œdematous swelling upon the mastoid. On the other hand, according to the reviewer's opinion, Koerner, *l. c*, p. 59, considers Griesinger's symptom justly as important, when the œdema of the mastoid is limited only to the region of the mouth of the mastoid emissary, viz., *behind* the mastoid process. With abnormal course of the emissary the swelling may be situated toward the centre of the occiput (*cp.* the reviewer's observation, Case 31 of the cases collated by the author).

Just as unreliable as mastoid œdema is, according to the author, *the œdema of the occiput* due to thrombosis of the condyloid emissary, which is noted four times in his collected cases.

"*Œdema of the temporal region*" is represented by three cases. "Moos tries to explain this œdema by the persistence of the fœtal sinus petro-squamosus, which enters the sinus transversus and communicates with the temporal veins. Although this hypothesis is not fully proven by autopsies, it seems at any rate to be too early to reject it without further ceremony, as A. Brieger has done in his dissertation."

Furthermore, the author discusses the *pain* and swelling above the jugular vein. This vein was thrombosed completely in 34

cases, in the upper portion only in 20 cases ; corresponding symptoms thus existed in 54 (38 per cent.) cases : œdema, sensibility, swelling, or a hard band, under the restriction, of course, that other affections than thrombosis of the jugular, *e. g.*, burrowing abscesses from the mastoid process, may cause painfulness and swelling of the lateral region of the neck.

Furthermore, the author discusses the *symptoms due to extension of thrombosis to the other cerebral sinuses:* Sinus cavernosus (7 times), longitudinalis (9 times), and sinus lateralis of the other side (6 times), in which case these symptoms could be made use of, if contra-lateral thrombosis of the jugular vein existed.

Characteristically stiff *position of the head* toward the affected side was found in the author's cases 4 times, *glandular swelling* at the neck 11 times, suppurating glands 5 times, *venous* hemorrhage from the ear 3 times, without positive proof of the source of hemorrhage from the lateral sinus. Among the *nervous* symptoms (13 per cent. of the cases) the author discusses the affection and paralysis respectively of the posterior cerebral nerves, their connection with thrombosis (*cp.*, the most exquisite case of Beck. —Rev.) of the facial, of the anterior cerebral nerves in thrombosis of the cavernous sinus, and dilatations of pupils in consequence of increased cerebral pressure.

Neuritis optica is rare in uncomplicated cases, and mostly to be expected at the beginning of the second week.[1] Case 15 terminated in atrophy ; on the other hand, Jansen asserts that restoration never leads to atrophy. He considers the choked disc, which, moreover, may increase after operation, as an important symptom of sinus thrombosis. It is, according to Jansen, always bilateral and is a differential sign which may serve to exclude with certainty the wrong diagnosis of typhoid fever, malaria, and pneumonia. Jansen has observed eight times nystagmus of both eyes. Jansen quotes all heretofore published cases observed in aural affections, with the exception of that of the reviewer (these Archives, vol. xi.), although Kipp is cited, by whom the reviewer's observation is mentioned. The nystagmus-like movements are, according to Jansen, symptoms of somewhat uncertain value, admit rather the inference of a labyrinthine affection, and, in the absence of the latter and also of leptomeningitis, are of a certain importance for the diagnosis of sinus phlebitis and sinus periphlebitis in the parts adjoining the temporal bone.

[1] Not unfrequent according to Koerner, and more frequent than in meningitis and brain abscess according to Pitt.

Icterus, observed by Forselles in 17 cases (15 per cent.), is hematogenous. Petechia and herpes (nasalis) were seen in 1 case. *Enlargement of the spleen* (in two infarcts being present) was noted, partly during life, partly at the autopsies, 37 times. (The tumor of the spleen is, according to Koerner, said *never to be absent* in the pyæmic form.—REVIEWER.)

Complications.

Pachymeningitis externa and *extradural abscess.* The former exists in most cases, at times as a connecting link in the production of the infection of the sinus, without especial reference, of course, having been made to this fact in the histories. The latter is noted in 26 cases, but was only exceptionally diagnosticated before the autopsy.

Meningitis occurred alone in 26 cases, and together with cerebral abscess in 14 cases. The pyæmic symptoms were less pronounced with this complication. In the pure cases, *e. g.*, pulmonary complications occurred in 55 per cent., in those combined with meningitis in 30.8 per cent., in those combined with meningitis and cerebral abscess in 28.6 per cent. Neuritis optica, however, is more frequent. With reference to the other symptoms *cf.* the original.

Cerebral abscesses were most frequent in the temporal lobe, then in the occipital, and in one case only in the parietal lobe; topical symptoms are nowhere noted, vertigo quite rarely (only in one case among three cases of cerebellar abscess).

The author states as follows: "I found the character of the pulse to be the only characteristic sign when topical symptoms were absent. It is usually slow (75–108 [1]) even when fever and pyæmic phenomena were present."

It is worthy of note that, according to the author, the pulmonary symptoms appear much later than the chills, and a difference of from one to three weeks may exist between the appearance of thrombosis of the jugular vein and the pulmonary symptoms.

Albumen occurs frequently in the urine, mostly during second week, blood in 2 cases, *diarrhœa* in 19 non-operated cases, rarely at the beginning, mostly during the third week. *Metastasis in the liver* in one case; *metastases in the joints* are frequent, but may un-

[1] These figures must be erroneous, as they are too large for the minimum and too small for the maximum. v. Bergmann found 46, Heimann 44, and the Reviewer 36 beats, and in the terminal stage 136.

dergo retrogressive changes, although mostly a long time after the first chill and after thrombosis of the jugular vein has occurred.

The *average duration of disease* in the 60 uncomplicated non-operated cases lasted from 3 to 4 weeks. The course, however, may be rapidly fatal, or more protracted.

The *diagnosis* and more especially the *differential diagnosis* has to consider: meningitis, cerebral abscess, intradural abscess, typhoid fever, malaria, miliary tuberculosis, septic endocarditis. The details should be perused in the original.

Although, for the *prognosis*, the possibility of healing by nature through transformation of the thrombus into connective tissue is to be considered, still most cases terminate fatally without operative interference. The author, therefore, warmly pleads for the latter, *viz.*, not only for opening and emptying the lateral sinus, but also for ligating and opening the jugular vein, in order to prevent general infection. His statistics, for which the author uses his own (4) cases operated with fatal issue, demonstrate: without ligation of the jugular, 40 % mortality and 53 % recovery; with ligation, 37.5 % and 62.5 %, respectively.[1]

According to measurements taken from 17 autopsies, the author recommends that the operation be performed at a point 9 *cm* distant from the prominentia occipitalis externa, upon a line drawn from the upper border of the orbit to the prominence, and that this be done even after the mastoid has been exposed by chiselling. The latter view is not in accordance with that of the reviewer, since the sinus is readily reached from the mastoid wound, enlarged backwards. The author uses trephine and bone forceps in order to avoid a possible concussion and detachment of the thrombus.

The Lip-Reading of Persons with Hardness of Hearing. Guide according to his own method of instruction. By JULIUS MÜLLER, Berlin. With a preface by Prof. Dr. A. LUCAE, Private Medical Councillor and Director of the Royal Aural Clinic of the University at Berlin. Reviewed by A. BARTH, Marburg. Review translated by M. TOEPLITZ, New York.

Nobody will argue against the fact, that it is just as necessary for persons with extreme hardness of hearing to read from the

[1] According to Jansen, the question whether the jugular should also be ligated cannot as yet be decided.

lips as it is for deaf-mutes. Since there are but a few individuals who learn lip-reading without instruction, this book may be of great assistance in this respect to many people. It would be of much more value if, as Lucae expresses it in the preface, most people were not lacking in the necessary energy for auto-instruction. They should be directed to a teacher, but the book will, at any rate, assist the instruction. It begins with a historical introduction upon the instruction of deaf-mutes. It then discusses the difference in the instruction of persons with hardness of hearing and of deaf-mutes. The former should only read from the lips, the latter should at the same time learn how to speak. The same method is, therefore, not adapted to both. In the following chapter on instruction in lip-reading, it is stated that people hard of hearing should learn to comprehend fluent speech. The instruction, therefore, does not occupy itself with position, but with movements of speech. The consideration of the latter is followed by remarks upon the accentuation of syllables, the best position of the learner with regard to the speaker, illumination, the manner of carrying on the conversation, observation of mimicry, and principally the right selection of the speaker. It is emphasized that in speaking, not the amount, not the quality, but the correct arrangement and treatment of the subject are of the greatest importance. The first introductory part is followed by the second for practice, in which the exercises are systematically treated in separate chapters. We hope that the book may be of great value to many persons hard of hearing, and facilitate their intercourse with others and that of their fellow-men with them.

EDITORIAL NOTICE.

The abundant supply of original contributions makes it impossible to furnish unabridged translations of all the papers from one edition into the other.

To secure priority, and inform our readers promptly of the contents of both editions, the titles of all the papers of one edition will be printed in the next issue of the other. Translations will be published as early and as fully as the space at our disposal will permit, and abstracts of all original contributions in either edition will be embodied in our systematic reports on the progress of otology.

Reprints of the original papers of the German edition are deposited with Dr. H. Knapp, 26 West 40th St., New York, and Dr. U. Pritchard, 26 Wimpole St., London, who will gladly loan them to any one who desires to use them for reference. Reprints of the originals of the English edition can in the same way be had from the publisher of the German edition, I. F. Bergmann, Schwalbacher Strasse 20, Wiesbaden.

H. KNAPP,
S. MOOS,
U. PRITCHARD.

The following original papers appeared in the double-number of the *Zeitschrift für Ohrenheilkunde* (German edition of these ARCHIVES), issued July, 1894.

1. Three fatal cases of otitic intracranial complications. By S. Moos, Heidelberg. With two temperature curves. [To be translated.]

2. The hearing for speech and for tones in general, and the measurement of the latter by Gradenigo's auditory field. By H.

ZWAARDEMAKER, Utrecht. With an illustration in the text. [Translated.]

3. A contribution to the symptomatology of rhinitis chronica atrophica with especial reference to the affections of the organ of hearing. By J. MORF, Winterthur. [Translated.]

4. On double-hearing. By HANS DAAE, Christiania. [Translated.]

5. Primary disease of the bony capsule of the labyrinth. By ADAM POLITZER, Vienna. With eight illustrations in the text. [Translated.]

6. Addendum to the article (No. 1 *supra*) upon three fatal cases of otitic intracranial complications. By S. Moos, Heidelberg.

Then follow: Translations from the English edition; the systematic report upon the progress of otology and rhinology, by A. BARTH, Marburg, and A. HARTMANN, Berlin; and reviews.

Contents of the last number of the *Zeitschrift für Ohrenheilkunde* (the German edition of these ARCHIVES), published in September, 1894.

A.—ORIGINAL ARTICLES:

1. A Second Case of Bilateral Ankylosis of the Stapes, Diagnosticated during Life, together with the Report of the Autopsy, and of the Manometric and Histological Examination. By FR. BEZOLD, Munich. (With three illustrations in one plate.)

2. The Hearing in Bilateral Congenital Atresia of the Auditory Meatus, with Rudimentary Auricle. By FR. BEZOLD, Munich.

3. A Case of Pachymeningitis Externa ex Otitide Cured by Trephining. By A. GUYE, Amsterdam.

4. Contributions to our Bacteriological Knowledge of Otitis Media Purulenta Chronica. By LEOPOLD STERN, Metz.

5. A Case of Epithelial Carcinoma of the Cartilaginous and Membranous Auditory Meatus and of the Auricle. By ALFRED DENKER, in Hagen, Germany. (With an illustration in the text.)

6. A Contribution to the Diagnosis and Treatment of the Formation of Cholesteatoma in Otitis Media Purulenta. By A. SCHEIBE, Munich.

B.—TRANSLATIONS FROM THE ENGLISH EDITION, AND REVIEWS OF BOOKS.

Obituary.

The death of Prof. HERMANN VON HELMHOLTZ, September 8, 1894, has been noticed in the October number of the ARCHIVES OF OPHTHALMOLOGY with remarks on the eminent scientist's life, character, and work, in particular his unparalleled merit in physiological optics. It behooves us gratefully to acknowledge what services he has rendered to Otology. His masterly investigation of the *Mechanism of the Ossicles of Hearing* convinced everybody that another very important problem in the physiology of the higher senses had been permanently solved.

Parallel with his investigations in physiological optics were those in physiological acoustics. For ten years he worked simultaneously at both. His *Treatise on Tone-Sensations*, though less extensive, may be said to be even more fundamental than his large work on *Physiological Optics*. With admirable penetration he—the first as far as we know—analyzed both mathematically and experimentally the third quality of sound, timbre (clang-tint), and demonstrated that, unlike the two other qualities, intensity and pitch, it was produced by a combination of tones, consisting of a fundamental tone and a number of harmonics, which he determined first mathematically (using Fourier's series), and then experimentally by having a number of balls ("resonators") made, which were tuned to the harmonics (Obertöne), the requisite number of vibrations of which, determined mathematically, was obtained by the corresponding interruptions of electric currents.

To determine the number of vibrations of any given sound with greater accuracy, he perfected the siren and constructed his *double siren.*

These studies have been as important for the theory of music, even for the construction of musical instruments, as the ophthalmoscope and his optical investigations have been for ophthalmology.

Helmholtz's searching mind logically and with unerring precision led him from the cultivation of one field to the exploration of the neighboring territory, and in all departments of his scientific labor he was not only an explorer but also a teacher. Many of his pupils are now men that have won distinction. Among those near us I may mention Dr. Albert H. Buck of New York, and Dr. Chas. H. Burnett of Philadelphia, whose researches on particular points in the mechanism of the ossicles, made in his laboratory, were published in the first and second volumes of these ARCHIVES.

May we not consider Helmholtz's simultaneous cultivation of physiological optics and acoustics as an explanation of the legitimate tendency of many physicians, especially in this young and enterprising country, to study and practise ophthalmology together with otology? Though anatomically these two departments are not closely connected, they have physiologically a great deal in common. The methods of examination and the functional disturbances of the organs of vision and hearing, as well as the physiological phenomena of the impression, conduction, and perception of light and sound are like words of two allied languages. The scholar that knows the one has a natural desire to learn the other.

H. K.

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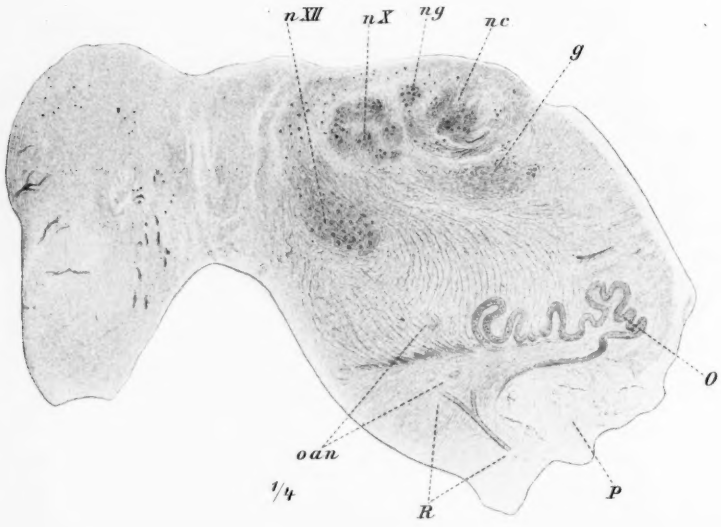

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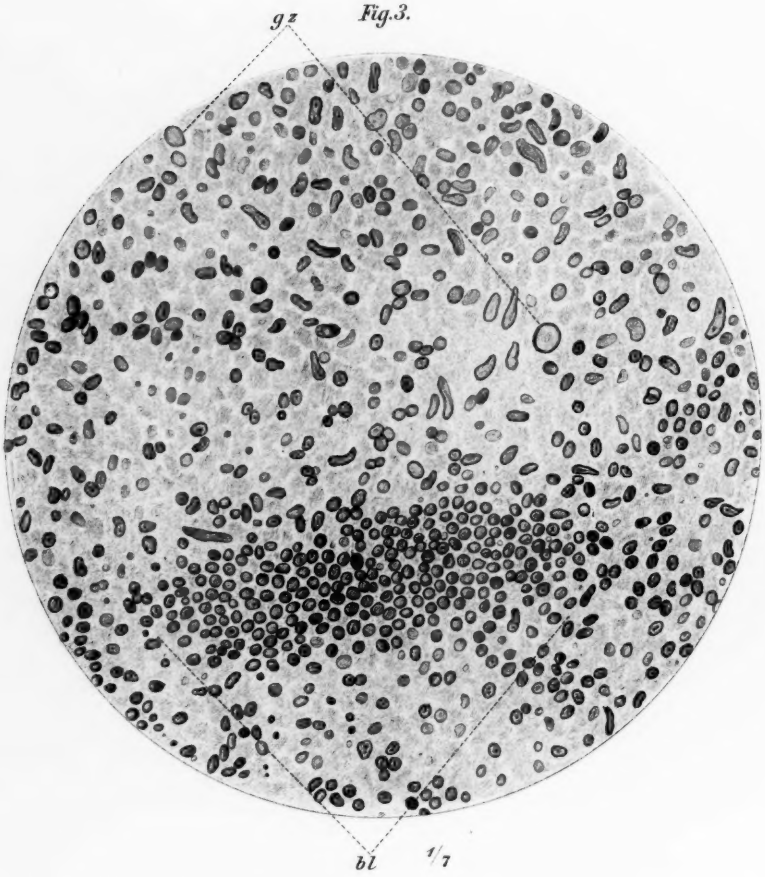

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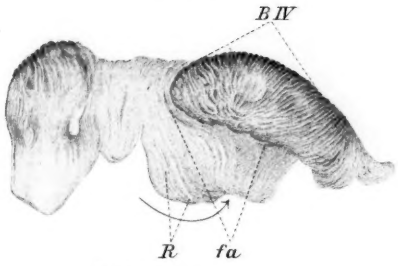

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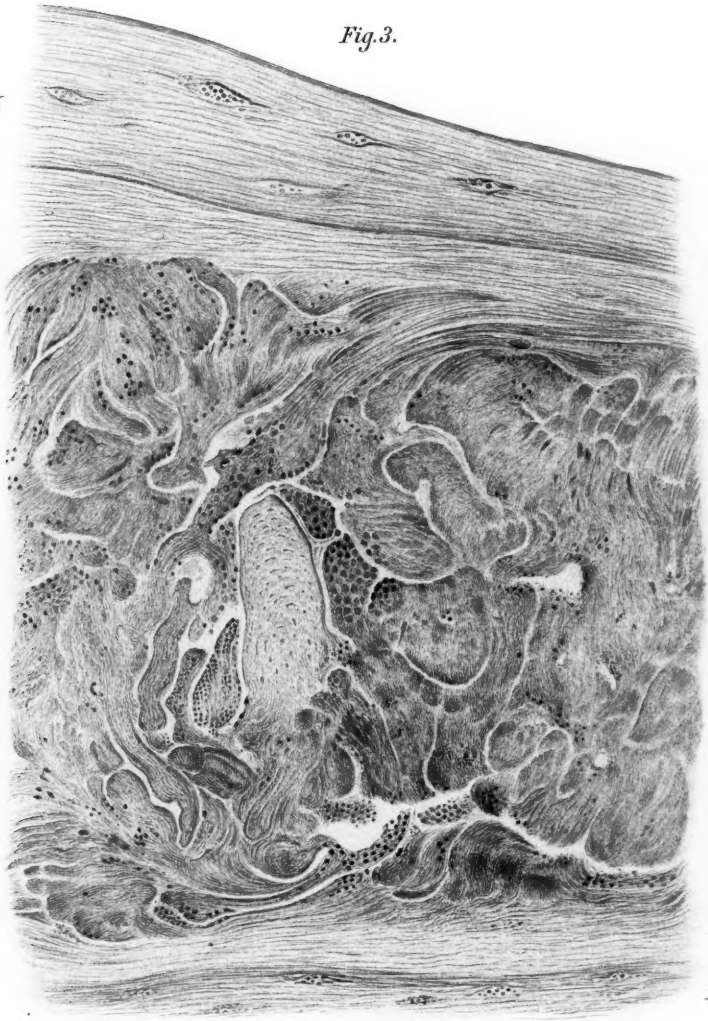

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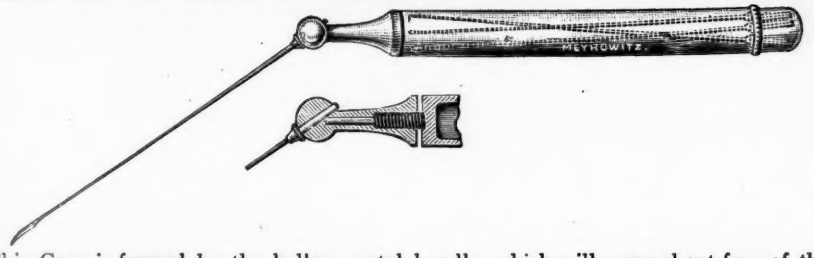

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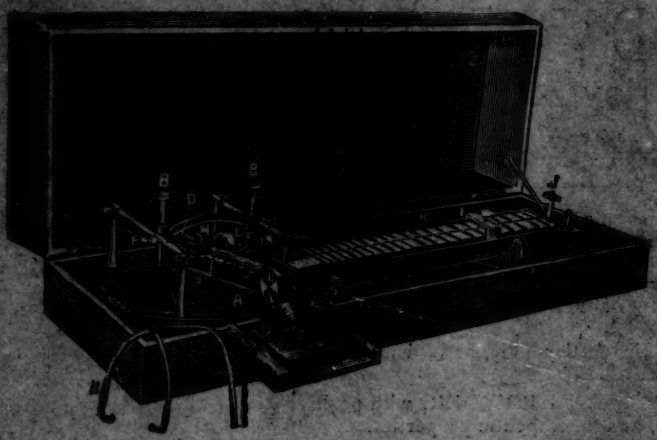

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